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THE FIORDS OF NORWAY.

BY

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Nowhere can the geographer find a more intimate blending of land and sea than along the shores of Norway. Islands of rock, an innumerable advance guard, fringe the continent as it fronts those northern seas, and, through protected waters behind them, the Norse mariner pushes his craft as if in his Viking blood he had inherited a knowledge of these mazy labyrinths where the ocean plays hide-and-seek with the mountains. America has in good measure her counterpart where the traveller finds shelter from the Pacific between Vancouver and Alaska.

Behind the island ramparts of Norway the fiords pierce the land, twenty, fifty, one hundred miles; and being a narrow land at the best, one has visited the interior when, indeed, he has scarcely gone more than a day's drive from the sea.

We have made up our idea of a fiord from Norway as offering a type, the finest examples which the world affords. A deep bay, long and narrow, with steep and lofty walls—such is the fiord, an attenuated arm of the sea, shut in by mountains. Often the water is deep, as where, in the Sogne, the plummet drops nearly 4,000 feet. Add 4,000 feet of cliff, in fancy drain the fiord, and you have a cañon almost a half mile deeper than that incised in the Colorado Plateaux.

Scotland has its fiords, but the bordering mountains are not commonly so lofty or so bold; Maine has an elaborately-fiorded coast, and, if we could raise the altitude of her seaward lands from scores,

or a few hundreds, to thousands of feet, we should have, in some measure, another Norway. Alaska is no doubt the best American copy of Norway; for there are found the ocean and the fiord, the lofty mountains and their snowfields, and glacial streams.

We may come nearer home, it is true, and find in the Hudson no mean example. Restore the ancient glacier, with its front at Peekskill, West Point, or Poughkeepsie, and we see the essentials of Norwegian geography. Pile four or five Palisades on each other, rear Storm King to a mile in height, send down ribbons of water from overhanging cliffs, deepen the waters at Newburg to three-fourths of a mile, and sprinkle the lower bay with mountainous islands, skirt the horizon with the midnight sun, and give the white man a thousand years of history, and you will have a Norway of your own.

This article will deal with geographic conditions rather than physiographic origins; yet a few words must be said about the causes of this indented shore-line. Some things we safely know. Here are mountains of crystalline rock shaped by the agents of destruction during long periods. That the coast has been upraised is plain to any one as he sees the elevated beaches and shore-cliffs, removed from the present operations of the sea. That the elevation just named represents but slight recovery from profound submergence seems equally clear. The pattern of the fiords is too intricate and tree-like to be due to deformation, shaping structural valleys; indeed, the foldings and crushings are so ancient that structural valleys would long ago have disappeared. Even the historian Professor Freeman speaks of "antler-like fiords," and thus points to the common-sense conclusion that these are river valleys made tidal by "drowning." Given mountains, plentiful rainfall, deeply-incised valleys and submergence, and we account for present arrangements, including the myriad islands isolated from the continent as the waters closed around rocky headlands.

The case is, however, not quite so simple; for many of the fiords deepen enormously after we pass their portals. Under the doorways, at moderate depths, are sills of rock or rock waste; then come long and narrow abysses until the water shallows again at the head of the fiord. The water in the outer end of the Sogne is usually less than 600 feet deep. Twenty-five miles from the entrance the depth is almost 4,000 feet. The Hardanger fiord is 1,500 feet deeper within than at its seaward end. This condition is repeated in Scotland, as where Loch Etive narrows at Connal Ferry and the rock-sill is so near the surface of the water that the ebbing tide pours over it in a boiling torrent. Within are 420 feet of water.

Raise Norway and long, deep lakes would replace the tidal waters in many fiord valleys. Ordinary streams do not scoop out such basins, and we seem driven to glacial ice, and to accept good measures of glacial erosion.

The glaciers are here, and the Justedal, covering 347½ square miles, is still a respectable ice-sheet. This and other ice-fields send down glacial tongues into the fiord valleys. These tongues have filled the valleys with ice of great depth, impelled by headstreams of ice pouring down slopes of exceptional declivity—in short, if we find the possibilities of glacial erosion anywhere we find them here. An English geologist has well observed that if the ice of Greenland were much reduced, that land would be as Norway is now. In former times, when Norway was as Greenland is to-day, the ice could exhibit its full power.

All the characteristic doings of ice are here—graven rocks, rounded domes, moraines, glacial cirques, and hanging valleys. These last, so fruitful in recent years in discussions of glacial erosion, seem more the rule than the exception. Everywhere are matured side valleys entering the trunk fiord valleys at heights of 300, 500, or 1,000 feet, and their streams have not had time to produce a recession of the falls whose waters leap abruptly into the fiords. Even the valleys joining the trunk valleys at tide-level would show vast discordance if the waters were drained out of the fiords.

All these conditions, with the profound basins lying within, as already described, force us, I think, to the conclusion that the deepening of these old river valleys is due to ice; and I believe this notwithstanding the magnitude of the work and evidences of slight glacial erosion in some parts of the fiords and of the valleys which succeed them at their heads.

In these very valleys, curiously near the head of many fiords, are deep lakes, separated from tidal waters by a short barrier of waste or of bed-rock and extending much below sea-level. These lakes are moraine-dammed, or in rock basins, and separated from the fiords, as the fiord lakes would, in case of elevation, be separated from the open ocean, by barriers of rock or rock-waste.

Norwegian scenery is ever recalling that of Switzerland, with this difference, that one can see so much of the Norse landscape from the deck of a ship. For days one follows the base of cliffs far higher and grander than those which arouse admiration for a short hour or two while passing the Highlands of the Hudson. The Swiss mountains are loftier; but they scarcely seem so, because their more

ancient northern neighbours rise abruptly out of the sea. As in Switzerland, the fiord mountains, rugged as they are, cannot dissociate themselves from human life.

Follow the Hardanger northward toward Odda in the early morning. The mountains are 4,000 feet high, and on the steep lower grounds are dark forests and farms. Shifting cloud-masses brush the high slopes revealing, as they pass, bare brown cliffs, hanging glaciers, and fields of snow. Small streams tumble down the cliffs in ribbons a thousand feet long; and while the air is chilly with surrounding snows, the houses are many, with adjoining patches of meadow and small plots of potatoes, here and there a white church, and all looking down on the only highway, the waters of the fiord, here a hundred miles from the sea.

The Naero Fiord, a southern arm of the Sogne, meets all one's expectations of loftiness, of depth, of seclusion and gloomy grandeur. At every turn it would seem that the end has come; but in the nick of time a new vista is disclosed as one draws nearer to the heart of the mountains. Now the rocks standing sheer overhead four-fifths of a mile show gray and black and verdureless, and then appear the deep-green coniferous trees clinging to the cliffs or clothing the tops of vast buttresses that support the giant walls. Between these lofty buttresses are narrow lateral gorges or spreading glacial cirques, which give unending variety to the cliff forms that reflect themselves in the still, deep waters below.

A small ship may anchor its own length from the head of Naero Fiord and be in 20 fathoms of water. The path that leads by the edge looks into waters so abruptly deep that only expert swimmers could afford to make a misstep. Above, the rocky precipices are as various and delicate in expression as they are lofty and magnificent —sheer black cliffs alternating with slopes of forest green, of soft grasses and luxuriant trees, and within single reach of the eye not less than eight bridal veils of spray mark the lines where the melting snows on the plateau above pay their tribute to the sea.

In sailing up and down the fiords the physiographer observes the scarcity of rock waste—a strange fact, in view of enormous and prolonged destruction of the mountain masses. Where is the talus and where are the alluvial cones of giant size that ought to be here? The answer is in the steepness of the fiord walls. The waste of to-day has gone down into the bottom of the fiord, while the earlier débris has been pushed out to the borders of the ocean by the ice, and the rock-flour spread by the waves on the sea-floor. But once pass the head of a fiord and traverse its valley and the accustomed forms re-

turn—lofty taluses and great cones and fans from the ever-dissolving mountains.

The tales of travel and our preconceptions of more northern latitudes have distorted the common ideas concerning Norway, making it cold, steep, and repelling, save as the tourist or the man of science seeks his ends in midsummer. There is more verdure than one has thought, not less of rocky grandeur, but good measures of refinement and beauty in the landscape also, a country hospitable and gracious in its display of sublimity and power. Wherever there is found a square yard of glacial waste or weathered rock, there some seed gains a place, the prevailing moisture atones for the poverty of soil, and a tree waves its branches above the waters interlocking with its fellows to cover the nakedness of these northern mountains.

Everything east of the Mississippi save Niagara seems trivial beside the waterfalls of Norway—cold product of ice and snowfield, falling in silver streaks through dark-green woods and playing with the clouds which so often hang low in the abyss. It is apart from my purpose to say more of a descriptive sort. Let us ask what the geographic conditions are which Norway offers to human life.

First is the all-including sea. One cannot go far from it in that long and narrow land. And every land-locked belt of tidal water opens into that uncertain region where the Atlantic doubtfully merges into the Arctic seas. It is along the fiords that the people live. If they go inland it is by the unsubmerged parts of these great valleys. But more often the call has come from the ocean, and from safe harbours the Norseman has gone out to sail, to fish, to trade, to discover, to fight, or to find new homes. Whatever tonic of opportunity the sea offers, whatever impulses lie in its music—all the imaginings of world-opportunity that come over its waves from beyond the horizon—these have been the Norseman's heritage and the staple of his daily life.

Mountains are the second condition of Norwegian life. Indeed, the country is all mountain, with some parts reduced more nearly to base-level than others. The heights are comparable to the White Mountains, the Adirondacks, and the Southern Appalachians; but in their declivities and barrenness, in their snow and ice, they are Alpine rather than Appalachian.

Great Britain is most analogous of the countries of Europe; yet how diverse—her mountains less high, long free from perpetual snow or glaciers, and bordered by plains where the people and the sources of national life are found. Great Britain has sea and mountains; Norway has these only, and her people must be mountaineers,

sea-faring though scores of thousands of them be. If you can imagine a composite of Switzerland and Holland, each bereft of its lowlands, you have left a kind of Norway.

A third geographic condition is climate, and we may look long to find a better case of agencies joining to produce it. Here we have high latitude, with its long winters and short summers. But we have also the proximity of seas well tempered by drift of more southern waters, and we have wide range of altitude. The mean temperature for January at Stavanger is 34.7°; while for July the mean is 55.0° —a climate not excessively severe in winter and comfortably warm in summer. Norway inland is, indeed, colder; but the fiord waters, with their great depth, form a reservoir of heat and life which it is hardly too much to say has made it possible for the land to have a history. There is little in the fruit and vegetables of temperate latitudes which the short but life-giving summer does not produce; and Molde, on the north shore of its fiord, its slopes facing the southern sun and looking out across the waters on a splendid panorama of peaks and snows, is famous for its roses. Could we imagine the fiord topography transferred to the tropics what should we see? We can picture the glory of tropical vegetation on those rocky walls, but it might be less than the majesty of the dark-green firs. We could not have the snows and waterfalls unless the mountainous plateau were vastly higher, and these secluded valleys would be insufferably hot. But why imagine, when fiord lands, at least in their typical display, seem confined to higher latitudes and to the fields of glaciation?

Norsemen get on well without a tropical sun, ripen wheat within the Arctic Circle, hops at Loffoden, and cherries in north latitude 66 degrees. Doubtless psychological effects not measurable in a laboratory have accumulated through centuries of inheritance under the subtle influence of the absence or presence of light in the long winter nights and unending summer days of that land. The summer sun sets at no early bed-time and rises long before the most enterprising farmyard monarch in America sounds his call to day. And in the hours called by custom night the sunset glow follows the horizon and mingles with the dawn.

Geographic position is the next element in Norwegian life. Peninsular as she is, she is more isolated from the continent than insular England. Yet she has had her hand in some true way in the affairs of Europe, because her fiords led out into the "broad, public highway of the Almighty." Her people have been less set apart than the mountaineers of Switzerland, even though the Alps have been in the track of great nations for twenty centuries.

The final item in the geographic conditions of the Norsemen's land is the limitation of its resources. Just so much can you get out of it and no more. Whittier writes—

> The frozen fiords were fishless,
> The earth withheld her grain;

and Björnson in plain prose reveals the habit of the farmers to expect one bad year, and sometimes two, out of every five. The stones and trees make it a burden to open new land, and on many slopes it is hard to keep the thin soil at rest. The wild torrents from the mountains have to be controlled where they cross the fields, and on such grounds primitive hand labour must ever be done.

The population, therefore, cannot pass a certain point, and is to-day in density the smallest in Europe—16 to the square mile, though even this is large when we remember the lonely wastes of most of our Cordilleran States. A sturdy type develops here, but cannot multiply, and the corollary is overflow, emigration. Thus it has ever been, from mediæval to the latest modern day—the Viking of old and his more quiet but equally blond sons of the twentieth century.

"I do not think," says Björnson, "there is any other nation which travels so much as my countrymen—as sailors to all parts of the world, as fishermen on their great fishery and whaling expeditions, as artisans, students, or men of science seeking knowledge and experience abroad, as merchants seeking new markets, and last, though not least, as emigrants."

Such is the environment of man in this northern land, with rugged mountains, omnipresent sea, circumscribed resources, and isolation which has nevertheless invited fellowship with the world.

Let us turn to Norwegian industry. Think of a country that has but 740 square miles of ploughed land! More, indeed, might be tilled were it not needful to keep it in meadow. In some places the Norse farmer has actually carried back to overlying slopes the soil which rains, in the process of tillage, have swept down upon the lower fields. No crop seems more luxuriant than potatoes, seen in garden patches, planted in rows not more than twelve or eighteen inches apart, and covering the ground completely when midsummer has come.

No agricultural process is of more interest than the haying, The dairy is the staff of life, and scythes, like a small sickle or a corn-cutter, are carefully wielded over rough and hummocky ground where the American farmer would turn loose his sheep. Yet in the better meadows the growth is rank and full, not tall, but soft, thick,

and fine, and matting so close that there is added reason for drying, as the people do, upon hurdles or trellises. Much too moist are the air and soil to cure grass in the way of other latitudes. It would become fertilizer rather than forage if left to cure on the ground. On the hurdle, its fine texture turns the rains effectively so long as sun and air need to continue their work. Thus haying proceeds along the fiords, while the saeter, the mountain dairy, is in operation on the heights, whither the cattle and the dairy maids have migrated for the summer period.

Sometimes from these heights a taut wire is stretched to the homestead below, down which, three thousand feet or more, the products of dairy and forest are transported. I did see haycocks at Oie in American fashion, and there are mowing machines in Romsdal; but, in great part, the cow standing docile in a small boat crossing the lake at the head of the Hardanger is a type of the primitive life of man and beast on the farms of Norway.

Let me classify the arable lands along the fiords with reference to their origin. Some fields are due to differential weathering, where rough and craggy ridges come down the mountain-side to the water's edge, and between them, on the waste of softer rocks, are irregular lanes of fresh green flecked with white cottages. At the heads of the fiords deltas may be found, though the depth of the water makes the land-growth of the delta small. More favourable are the heads of the lakes for delta expansion; and where a lake intervenes but a short distance from the head of the fiord it pockets the sediment and sends the waters of the valley into the sea free from waste.

As in our own northern States, filled lake-basins abound, with meadows and fields. Other physiographic forms whose surfaces are used by the farmer are the alluvial cones, slopes of talus, and the ordinary flood-plains. There are delta terraces also, marking the level of lateral discharge into the fiords in the more submerged state of the region; also glacial moraines, sand-plains, terraces, and valley trains.

Another product of differential weathering—or, perhaps, sometimes of differential glaciation—is found in the lofty shoulders of rock, on which, far above the sea, on dizzy perches, farms are placed, seemingly inaccessible. The floors of matured lateral valleys also, whether now hanging or at the present base-level, offer another foothold for the home-maker and the tiller of the soil. The elevated strands, as at Aalesund and many points in its neighbourhood, contributed soils to the land in the time of their uprising.

I have consulted no statistics to learn the relative importance of Norwegian industries. But the commerce is not small; for though the land has not much of its own to transport, its people take rank among the great carriers of the world.

Perhaps the railroads are the least important factor in transportation, and they seem, even prospectively, of less account than the Government highways, built with infinite toil, under the direction of skilled engineers, inward from every fiord head, toward the capital.

The water is the Norse road: children go to school by it, wedding parties go to the church over it, the farmer goes to market upon it. Mail steamers thread the watery mazes everywhere, and where they cannot come up to a pier, a small boat puts out at morning, or noon, or in the twilight of the night, to send to Bergen or some far-away port tubs of butter or boxes of fish; and if the fish is too long for the box, it is small matter, for the tail sticks out, while the cover is nailed down, and somebody is fed from the nourishing waters among the mountains.

Old and young are accustomed to the water. The children might as well have been born upon it, so much at home are they with rowing craft; and I have seen young girls with unconcern gathering berries on the brink of a precipice. Neither young nor old have learned to be "afraid of that which is high"; they take their country as they find it, summer sun and winter snow, and make the remotest strand the centre of the world, though sunk so deep in the mountains as to seem lost to the outer life.

The Norseman has never failed in his mastery of the wild nature in which he lives, and the inheritance of a stern and stormy zone seems to appear even in the slow farmer boy, who, with his yellow horse and harness of rotten cord, runs you down at breakneck speed along the edge of cliffs, scaring you to desperation, but bringing you safe to the foot of the mountain. No doubt a cautious New England driver would break the harness, overturn the vehicle, and bring you to disaster. There is something to warrant Boyesen's picture of the "tall, blond men with defiant blue eyes who obeyed their kings while they had confidence in them and killed them when they had forfeited their respect."

There are harbours everywhere, and every fiord mouth has been for ten centuries a challenge to see the world. It was inevitable, therefore, that Norsemen should breathe the ocean air and go forth. Their errands have accorded with the stage of civilization which, century by century, they have attained. And they have thus crossed

the sea for discovery, for robbery and conquest, for commerce and for new homes. They are strangers to no land where ships may come;

> The wolf beneath the Arctic moon
> Has answered to that startling rune;
> The Gael has heard its stormy swell,
> The light Frank knows its summons well;
> Iona's sable-stoled Culdee
> Has heard its sounding o'er the sea,
> And swept with hoary head and hair,
> His altar's foot in trembling prayer!*

Nearly all the towns of Norway are on its fiords, and often at their heads. Such are Christiania, Bergen, Trondhjem, and smaller tourist places, as Odda, Gudvangen, Merok, Helslyt, Naes, and many others. On or near the open ocean are such busy fishing centres as Aalesund and Christiansund.

With farming and carrying, fishing finds a normal place; for thousands of men till the soil in the summer and man the cod fleets in the winter months; or the women may manage the farm, maintaining independence and vigour while their husbands are far off along the coast courting danger and gathering the harvest of the seas.

Not all the fishing is done in distant seas; for on the dusky water of the fiord in a summer night, under the shadow of the inclosing mountains, you may descry a little fishing fleet, each boat bearing an oarsman and another standing with the line. The Norwegian will fiddle at the top of the salmon stairs, and apparently await his catch with the same philosophy which belongs to the fisherman of all times and all lands, and when one visits the fish markets at Bergen on Saturday morning and sees on the public square the quietly-chaffering throngs of common people, and looks over upon the small boats that crowd the wharf, filled with innumerable fish, he has perhaps seen the most typical exhibition of human affairs in all Norway.

Agriculture, fishing, and commerce—these are the resources. Agriculture is at its limit until the mountains waste away or an uprising continent lays bare the submerged ruins of northern Europe. The seas are fruitful, and a stable but moderate wealth will always be drawn from them. Perhaps, too, Norway can own more ships, and lure thus the world's money to support a larger population. One thing she could do if she could get at the raw materials of manufacture: her falling waters would propel the wheels of all the

* Whittier's "The Norsemen," a poem on the visit of these mariners to New England.

civilized industry of Europe and America if they could be utilized. Perhaps we shall have no regrets if somewhere nature cannot be put in harness. When Niagara has gone dry and our Atlantic States are no more the home of unpractical and idealistic sentiments about the natural world, an increasing number of unpractical men and women will go over the sea to find yet a land where nature is unspoiled and where syndicates have not acquired title to the rights of the soul.

Will Norway lose her charm for the lover of natural scenery? And will her people be brought into monotonous uniformity with the conventions of modern civilization? No measure of natural splendour will eliminate the shallow tourist and bring to those great scenes only those who are prepared to appreciate them. There is no law to forbid the American tourist from rushing on deck as you are sailing in the early morning up that fine watery path to Odda and crying in your ear, Where is the end of this "ford"? and, What is there to do at "Oddy"?

Edmund Gosse, revisiting Norway after a quarter of a century, saw many changes; but he did not think the land could easily be spoiled. Much of it can never be anything but wilderness; for the "spirit of its landscape is as untroubled by satiety as Shelley's skylark." But Norse character—will it be spoiled? It is a surprising experience to pull up at the docks of a city of 70,000 people, let down the gang-plank, and see many hotel porters and cabmen, in perfect and pleasing silence, refusing, even if you wait an hour to come on shore, to solicit a job at your hand. Forty years ago it was the same, and sturdy hackdrivers smoked their pipes with a philosophical indifference not easy to understand. Gosse explains it as a kind of shy defiance, shown by men who will not be patronized but will stand on their native dignity.

With this simplicity are many tokens of modern life. There sounds the gong of electric cars, and the sign "holdplatz" abounds. There is machine typesetting in Trondhjem; and I have not heard that there are strikes among the operators. Aalesund was burned, and its wharf is as busy and dirty as any latitude can show; while a professional diver goes up and down, laying a foundation for a new pier wall. At Bergen is the ubiquitous "Berlitz school"; and the Mutual Life of New York, "Stiftet 1843," is announced by a sign of twenty-four letters in one word, which would baffle any Yankee tongue. The dog looks into a gramophone, the "Circus Norbeck" goes on in its career of popular amusement, and the Grand Café tries our notions of primitive simplicity, with its gilded ceiling,

dress coats, orchestra, its many courses, numerous wines, and parlours with palms and paintings.

But the influence of the land will not fade. Norwegians cannot become a race of effeminate men. It has been said that to name Björnson in any assembly of Norsemen is like running up the national flag. His own lines have become the national song, and such they are because in them Nature sounds her call—a call which must fill the native ear and re-echo in the heart:

> Ay, we love this land of ours,
> Crowned with mountain domes;
> Storm-scarred o'er the sea it towers
> With a thousand homes.
> Love it as with love unsated
> Those who gave us birth,
> While the saga-night, dream-weighted,
> Broods upon our earth.

Here is a people wonted to solitude, each household turning up the stony soil beneath the overhanging mountains, and often they must sail their boats up or down the long fiord to find a neighbour. Peaks, glaciers, snows, clouds, and blue waters have written themselves in unconscious lines upon the heart, with impressions too deep to be effaced or forgotten. They are an intelligent people, and know the history of their lonely North. Still they write the reminders of the past upon the ships that sail to-day, and the breath of the north wind is not far away, even in busy Bergen harbour, when you read—King Erik, Kong Halfdan, Vikingen, Raftsund, Sverrie Sigurdsson.

Thousands have made their home over the sea; but they do not forget. The spell of the land is on them—the aurora, the long summer day, the calm winter night, the small tillage and frugal ways, the mountains, waterfalls, and the sounding sea: these join in reactions which no chemistry can follow to turn the Norsemen in wild fancy, if not in bodily presence, to the land that bore him, reared him, and made him her own:

> There's a land where the snow is eternally king,
> To whose valleys alone come the joys of the spring;
> Where the sea beats a shore rich with love of the past,
> But this land to its children is dear to the last.

THE MISSISSIPPI RIVER AS A TRADE ROUTE.*

BY

ROBERT MARSHALL BROWN.

The history of the Mississippi River as a highway of commerce, like the history of many enterprises and nations, shows a period of rise, a period of maximum importance, and one of decline. The curve which could represent its variations would not be a regular one, but would display numerous interruptions, the expression of a temporary impetus given to traffic by certain combinations of favourable circumstances, or of a reversal in the progress of trade. During the middle third of the last century the traffic along the river increased rapidly. No competitor to the river as a path of travel and transportation between the interior and the Gulf seaboard existed. Towards the end of this period a reality and a superstition checked the growth of the river transportation. A railroad to New Orleans, constructed about the year 1865, opened another route to the Gulf, and turned some of the products of transportation from the old river route. At nearly the same time there seems to have been a belief among the merchants and traders in grain that the transit of grain through zones of warmer weather was injurious to that staple. During 1869, the St. Louis Grain Association determined to test the sense of this belief, and planned to ship a cargo of grain to Liverpool each week during the summer. About 500,000 bushels of wheat were shipped, and arrived at the port in good condition. As far as the climate was concerned, there was no longer a barrier to the shipment of grain *via* the Gulf. The cost of transporting, loading, and unloading, and the rate of insurance for a cargo from St. Louis to Liverpool, were reckoned at $.37 per bushel—about the same price as is recorded to be the rate, now, from Dubuque to New York *via* Chicago. Another event which made these years a transition period in shipment was the change in the manner of transportation along the river itself during the years 1867 to 1869. The old manner of shipment by steamboats, as they chanced to come along, was uncertain, and it was also laborious. It was necessary to put the grain in sacks—in part to expedite the loading and unloading, but largely because the storage conveniences of the river boats demanded it.

* Compiled in part from the Reports of the Mississippi River Commission.

About this time barge lines began to be organized, and the shipment of grain in bulk was made possible. The towing of several barges filled with wheat and hastening to New Orleans gave added dignity and a new importance to the grain route down the Mississippi. Notwithstanding all this, during the years which followed, when the shippers were free from the superstitions of the warmer zones' effect on the grain and with the increased possibilities of river shipment, much of the grain was freighted overland from St. Louis to New York and there loaded for foreign trade. The shallow water in the distributaries of the river, which did not allow vessels of over 15-feet draft to enter the Passes, was detrimental to the Mississippi as a highway for grain. The St. Louis Grain Association, in proving the worthlessness of the fear of a warmer climate, demonstrated that, on account of the small depth of water in the Passes, the river port could not compete with any show of success with the cities along the Atlantic seaboard. In 1879, Captain Eads, by means of the jetties in the South Pass, secured a deep-water channel which allowed the passage of vessels of 26-feet draft. Now began another period in river transportation. A very large increase in the total number of bushels of grain exported by river in the two or three years following 1879 is recorded. In 1880, one-third of the total grain shipments from St. Louis was sent down the river. For 1879 the percentage was 18.

An interesting compilation in the form of a table is printed in the Mississippi River Commission Report for the year ending June, 1901 (p. 38). This table shows the character and amounts of the river business for the port of St. Louis during the years 1865 to 1900, inclusive. There has been during these years a rather persistent decrease in the amount of river traffic. The number of boats arriving at St. Louis in the five-year period from 1896 to 1900 was 31.6 per cent. less than for the five-year period from 1865 to 1869. There is also shown in the table a decrease of 39 per cent. in the total tonnage of freight, received and shipped, from the five-year period 1871-1875 to the five-year period 1896-1900. The ratio of the river traffic in grain to the entire grain traffic shows many fluctuations. The percentages of the year 1881 (37) and of 1880 (32.6) marked the upper range. These are much in excess of the other years, and record the first rush of traffic following the location of the jetties. For 1900 the percentage was 6.4. Since 1876 but two years show a smaller percentage—5.4 for 1899, and 5.7 for 1895. The freight rates per bushel of wheat, from St. Louis to Liverpool *via* the river and New Orleans and also between the same points *via* New York,

are tabulated. These rates cover the period from 1883 to 1900. The river-route rates range from 19.6 cents in 1883 to 11.64 cents in 1894. During 1900 the rate was 14.64 cents per bushel. The route rates *via* New York ranged from 27 cents in 1883 to 18.41 in 1900. It is noticeable that the differences in the rates for the two routes have grown persistently less during this period; and the least difference in any year of the record was in 1900—a difference of 3.77 cents. It may be that this lessening difference in transportation rates is a reason for a portion of the decrease in river traffic. The difference in price between the two routes may now be so small that it is counterbalanced by the difference in time. The discussion of the table in the Report ends with this statement:

> On the whole, the decline in volume of river traffic at the port of St. Louis has not been as great as commonly believed, and is still a very important factor in the problem of cheap transportation, which becomes more and more imperative as margins of profit in trade and manufacturing grow smaller. The inevitable result must be an increasing use of the river as a commercial highway.

There seems to be no warrant for the optimism of this last sentence, except the tendency of men to see things as they want them to be.

It has been shown* that during the ten-year period from 1890 to 1900 there has been a gain in the total tonnage of vessels entered and cleared at the port of New Orleans. This gain amounted to 66 per cent. In this same ten-year period seven Atlantic ports show a gain of 48 per cent., and five Gulf ports a gain of 111 per cent.

> The absolute gain of the vessel tonnage of the seven Atlantic ports named was 2½ times the absolute increase of the tonnage of vessels that visited the five Gulf cities, but the percentage increase of the Gulf ports was 2½ the percentage growth at the Atlantic cities. . . . There is no probability that the Gulf cities will ever surpass the North Atlantic cities in the total volume of trade, but the redistribution of American trade now in progress will give the Gulf cities a greater share than they have had or now enjoy.

During the same ten-year period that yielded a gain in the commerce of New Orleans of 66 per cent. there was a loss of river shipments at St. Louis of 60 per cent. St. Louis is not the only port along the Mississippi River with traffic connections by water with New Orleans; but inasmuch as it is the dominant centre of the Mississippi Basin, any loss in its river traffic must reflect a similar loss in the total sum of river traffic. The gain of 66 per cent. at New Orleans could not easily result from an increase in the traffic of other riparian ports while the percentage of loss at St. Louis was so large. A tabulated statement of the traffic passing the port of Louisville, Kentucky, on the Ohio River, is published in the Reports of the Mississippi River Commission (1901, 40). The year 1900 showed a loss of 40 per cent over the year 1890 in the total amount of freight

* Johnson, E. R. Report of the Eighth International Geographic Congress held in the United States, 1904, p. 817.

of all kinds. From 1880 to 1890 there was a gain of such moment that the five-year period 1896-1900 shows a gain over the five-year period 1880-1884. The movement towards New Orleans, in other words, must be an overland traffic at the expense of the river line. Whether this decline in the river trade will persist or whether some new feature in the future will restore to the river its prestige is problematical. The railroad lines to New Orleans, which even now promise to be more numerous, are likely to be persistent and damaging competitors to the slower and more uncertain waterway route. Several factors, however, are making for an increased use of the river as a highway:

1. The maintenance of a low-water channel. In 1896 the project of sustaining dredges which should operate during the low-water season from July to January was adopted. It was the plan to maintain a standard channel of 9 feet of depth, and with a width of 250 feet, from Cairo to the Gulf. During 1899 a navigable channel of 8½ feet was maintained from Cairo to New Orleans. This work was accomplished easily by five dredges, one or more of them being in operation from August 11 to November 26. The engineers in charge of this work have concluded that the successful opening through a bar depends largely upon two factors, only one of which it is in their power to control. The factor that is beyond their control is the water condition presented by the season. If the stage of the river remains constant or steadily falls, a good channel, once opened, will remain good. If, however, there is a rapid decline in the stage of the river, the increased deposition of sediment is liable to refill the channels. The second factor is the skill with which a location is made. If a channel is located on lines that coincide with a river crossing, the river will probably assume that direction and improve the channels. With a bar blocking the river crossing and diverting somewhat the position of the thread of the river, considerable skill is demanded in determining the proper location for the channel. During 1900 a channel of 10½ feet was maintained; during 1901, 9 feet; 1902, 9 feet; 1903, 9 feet until December 5. The low-water seasons of 1903 and 1904 show some interesting comparisons. The high water of the spring of 1903 was expected by the engineers to produce an unfavourable effect on the low-water channel. As the amount of sediment a river can carry depends largely on its volume and speed, it was natural to suppose that on the decline of an excessive flood more obstructing bars would result than during a season of lesser flood. The 1904 flood was a flood of almost equal magnitude to that of the previous season; but, follow-

ing so closely after the 1903 flood, its importance and destructiveness suffered considerably by arriving before the river conditions and the riparian dwellers had become wonted to lesser heights. The conditions following the floods were, however, very diverse. The decline of the 1903 flood was a gradual one; while that of the 1904 flood was sudden. The result of these two conditions on the amounts of dredging is marked. No dredging during 1903 was necessary until about December 5; during 1904 dredging was begun about August 22. In the latter case a low stage was reached early in the season. On August 22, when dredging began in 1904, the river had fallen at Vicksburg 23 feet since July 24, or from 54 feet to 31 (Natchez datum). During the same dates of 1903 it fell but 2 feet, or from 41 feet to 39. The dredging height, 31 feet, of the season of 1904 was not reached during 1903 until November 25. So open was the river during this latter year that the engineers became over-confident and considered their work for the season done. This resulted in the stoppage of navigation earlier than is customary. A combination of circumstances, growing, mostly, out of relaxed vigilance, coincident with the sudden fall of water early in December, put a stop to navigation. The engineers account for this failure to keep an open way by the following reasons: The season was considered closed, there was a scarcity of coal, numerous accidents occurred, severe storms and freezing weather followed. Such experiences are salutary in the long run, in that as a result of them recurrences are the more carefully guarded against. However, during a limited time subsequent to the disaster such relapses of the river tend to decrease the confidence of the navigators and shippers in the work that is in progress.

2. The survey for a 14-foot waterway. The River and Harbor Act of June, 1902, provided for the consideration of a waterway 14 feet deep, from the mouth of the Illinois, *via* the Mississippi, to St. Louis, in connection with a 14-foot waterway from Lockport, Illinois, to St. Louis. An examination and investigation is now in progress; plans are being prepared, and the cost estimated for such a course. It is likely, in case such a course is declared feasible and put in operation, that some addition, not large, to the traffic of the Mississippi River will result therefrom. In this same connection, Miss Semple* states that a proposition was recently made to the United States Government by the president of a large railroad system having its terminus in St. Louis that the Government im-

*Semple, E. C. American History and its Geographic Conditions. 418.

prove the Mississippi River so as to secure a 12-foot waterway from the mouth of the Missouri to New Orleans.

3. Opening of the Panama Canal. It is not unlikely, with the redistribution of commercial activity in favour of the Gulf cities, and the possibilities of an Isthmian canal, which may further increase the importance of these cities, that an impetus may be given the river traffic and the decline in its freightage be checked.

Over against the items favourable to an increased river traffic may be placed the tortuous path of the river, the uncertainty at both the high and low water stages, and the slowness of river traffic in general. The distance from St. Louis to New Orleans by river is over two and a half times the mileage by rail; and this added to the slower rate of water traffic accentuates the difference in time. The ratio of time by land and by water is about as 1 to 10. During the year traffic is liable to be blocked through various contingencies. The winter season may be cold and icy; during the high water of the spring months, when the levees are full, the boats may be ordered to move at reduced speed, so as to prevent the wash of waves against the levees; and during the summer and fall some uncertainty may exist concerning an open waterway. An indication of the tendency of the times may be read in the retirement from business of the St. Louis and Mississippi Valley Transportation Company, which had been for years the principal carrier of grain and other freight between St. Louis and New Orleans. The Monongahela River Consolidated Coal and Coke Company purchased their entire equipment of three large tow-boats and thirty barges.

It must not be understood that the traffic of the river has declined beyond the point where the outlay for improvements of the navigability of the stream is not fully compensated by use. It is not the expectation that the decline will ever reach such a point. The river will, probably, always be a factor in the commerce of the Valley, although it is improbable that it will ever again attain to paramount importance.

Worcester, Massachusetts.

DRUMLINOIDS OF THE CATATONK FOLIO.*

BY

GEO. D. HUBBARD.

The area designated the Catatonk Folio includes the Dryden, Harford, Owego, and Apalachin sheets of the United States Topographic Atlas, and is situated in the south central part of the State of New York. Ithaca lies near the northwest corner, Owego near the southwest corner, and Binghamton two or three miles beyond the eastern boundary. The Pennsylvania line is coincident with the southern limits.

The region is a part of the maturely-dissected upland of the northern portion of the Allegheny Plateau, and has a relief of 1,500–1,600 feet. The continental glacier once covered the entire area, and extended 50 miles or more beyond;† and in retreating did not leave appreciable moraines in the southern part of the area, but heaped large accumulations in the northern part. Most of the glacial striæ indicate a movement from E. N. E. or N. E.

While there is a great variety of morainic form and distribution in the northern half of the area, and much of interest has been found there, in the southern portion the glacial field is quite monotonous. By far the most attractive till deposits here are numerous rounded hills, usually drumlin-shaped, and distributed rather unsystematically. They vary in length from less than one-eighth to fully three-fourths of a mile, and in height from 15 to 100 feet. Because of their resemblance to drumlins they will be termed drumlinoids.

Descriptions.—In the Harford sheet, which was mapped by Mr. B. S. Butler, the village of Nanticoke is on one of these rounded or elliptical hills, ten of which occur in the one valley. Numerous village wells reach a depth of from 30 to 80 feet, and not one encounters bed-rock. Yet the deeper wells extend below the bottom of the hill. A short distance south of Nanticoke are

* By permission of the Director of the United States Geological Survey. The field work of this paper was done while the author was acting as an assistant to Professor R. S. Tarr under the U. S. G. S. in the study of the physiography and quaternary geology of the Catatonk Folio. Some of the drift forms herein described were mapped and studied by Professor Tarr, and others by Mr. B. S. Butler. Acknowledgment to both is gladly made for contributions received from their work and for many suggestions made during the development of the interpretation of the phenomena. In addition, Professor Tarr has read the report and given valuable criticism and suggestion.

† Lewis, H. C.—Second Geol. Surv. Pa. Z. Ch. 2 and 3.
Wright, G. F.—The Ice Age of N. Amer. Ch. VII.

three similar hills, and about the same distance north are four more; while 2¼ miles N. W. is another pierced by a well 18 feet deep through till. Just beyond the latter is a still larger one, with one well 18 feet deep and another 80 feet deep. Neither well touches rock, but each is reported as having passed through hard-pan most of the way. The 80-foot well goes below the base of the hill. All the above ten till-masses stand out abruptly into the valley, forcing the stream to one side and sometimes requiring it to cut in rock.

Another characteristic mass occurs on the Apalachin sheet about a half mile north of Gaskill. (See Fig. 1.) The valley in which it lies is a broad, mature form with a well-developed flood-plain for some distance both above and below this point. The till lies athwart the valley very much like a great dam, higher in the central part than at either side, in outline nearly circular, and about 600 yards across. Its total height above the bordering stream-bed is about 100 feet. So completely does this mass of material obstruct the valley that the stream now flows in a rock gorge 25–75 feet wide along its eastern margin. The rock wall on the east rises precipitously almost 75 feet; but on the west it only shows at one point, where it rises about 10 feet, above which is a till slope of 20–30 feet. (See section, Fig. 2.) The hill is smooth and rounded. An old dug well whose depth is not exactly known, but is in the vicinity of 25 feet, is found near the north side. Between the till hill and the rock wall on the west side of the valley is a low col some 30 feet below the hill top. There must have been a similar but lower one on the east side. Apparently there was a time when this dam across the valley ponded back the waters until they overflowed at

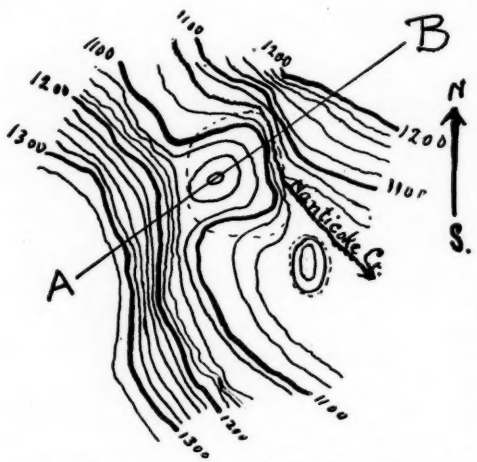

FIG. 1.—CONTOUR MAP OF DRUMLINOIDS, NANTICOKE CREEK, ½–¾ MILE NORTH OF GASKILL. SCALE, 2 IN.=1 MILE. ENLARGED FROM APALACHIN SHEET.

the lowest place, that probably being above the present rock gorge. The lowlands to the north consist of fine sand and clay at the surface.

A quarter of a mile upstream from this large rounded hill is another similar form more separated from the valley wall than the last but not discerned by the topographer. This one is twice as long as broad, rises 60 feet above the stream, and lies with its long axis essentially parallel with the valley at that point, and on its northern slope presents a morainic surface. South of the large mass, above described, the valley contains two more small similar hills, one of which appears in Fig. 1.

FIG. 2.—CROSS SECTION AT A—B, FIG. 1, VERTICAL EXAGGERATION 8½. DOTS = TILL. LINES = ROCK.

In the valley of Barnes Creek, one and one-half miles northeast of Owego, occurs a small ovoid hill, which forces the stream against rock on the east. Its long axis, 250–300 yards in length, lies north and south and parallel with the valley. A definite sag may be seen between the hill and the west valley wall; and the surface of the former is a little irregular and has one little swamp. There is a good flood-plain below this obstruction, and also for a mile and a half above; but the stream passes the hill in a narrow gorge, in which the Owego Water Board has caused to be erected a dam to retain water for a city supply.

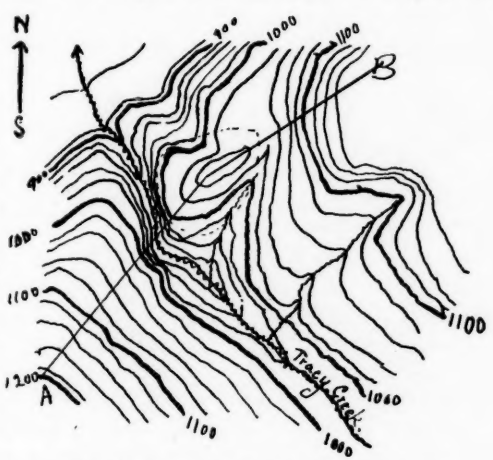

FIG. 3.—NEAR THE MOUTH OF TRACY CREEK A CROSS RIDGE NEARLY CLOSES THE VALLEY. SCALE, 2 IN. = 1 MILE.

Near the mouth of Tracy Creek on the Apalachin sheet a ridge, which seems to be essentially all till, lies exactly across the valley. (See Fig 3.) Its surface is smooth and rounded, and not the least

morainic. The creek flows through a broad flood-plain for five or six miles above this point, and then, as it runs along the west side of the obstruction, is forced into a narrow rock gorge. The gorge has a high steep bluff of rocks on the west, but only a low one on the east, composed of till, in which the rock shows at but one point. (See section, Fig. 4.)

FIG. 4.—CROSS SECTION AT A—B, FIG. 3. DOTS = TILL. LINES = ROCK. VERTICAL EXAGGERATION, 8½.

In the next valley to the west, that of the Apalachin Creek, about half a mile north of South Apalachin, may be found a neat little rounded hill rising in the midst of the valley and tied to the west valley wall by heavy till deposits, which present in part a smooth surface and in part a morainic one. A stream cut on the east exposes only till. The whole structure at this point resembles much a morainic loop, save that its northern and eastern portions are very smooth.

In the valley of the Choconut, where these peculiar forms first attracted marked attention, there are nine individual examples, and clustered to the east of the mouth are four more of doubtful character. All are rounded and some bear striking resemblances to the drumlins of the Syracuse-Rochester, N. Y., district.* Where one axis is appreciably longer than another it lies parallel with the valley, except in one case. Of the four at the mouth of the valley, the two outer ones are parallel with the Choconut, while the two inner ones are parallel to the

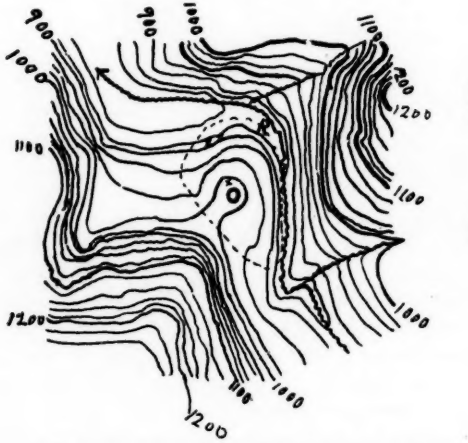

FIG. 5.—DRUMLINOID TWO MILES UP-STREAM FROM VESTAL IN CHOCONUT VALLEY. SCALE, 2 IN. = 1 MILE.

* Lincoln—Amer. Jour. Sci., Vol. XLIV (1892), pp. 290–301.
Tarr—The Phys. Geog. of N. Y. State, pp. 146–151.

receiving Susquehanna. Not all of these thirteen hills have been proved to be of till. Several are apparently of till, others may be. Three will be described in detail. The first one encountered after entering the valley lies about two miles from Vestal, a station on the Delaware, Lackawanna and Western Railroad. It is about a half mile in length and nearly a fourth in width, and rises a hundred feet above the stream. Its north end is the broadest, but the middle portion is the highest. The surface is of a weak sag-and-swell type, with no swamps; while between it and the west valley wall there is a well-marked depression. (See Fig. 5.) Two wells on its northern slope are 18 and 23 feet in depth respectively, and neither encounters rock. One on its summit is open and 45 feet deep; no record of material passed through could be found, but a large dug well would scarcely be made in rock. The hill is so situated in the valley that the stream flowing in a broad flood-plain both above and below this point is here crowded into a narrow channel for a third of a mile, but no rock appears at any point in the cut. The whole section is a typical till cut. The stream cuts against rock in the east valley wall just north of the gorge at R in Fig. 5.

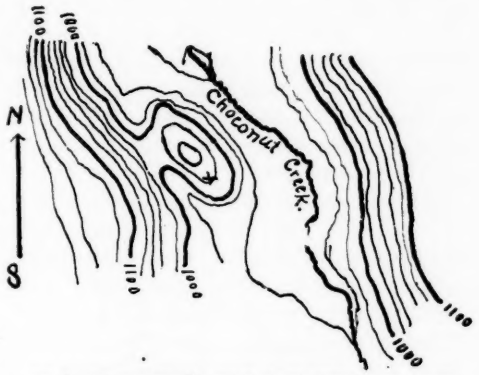

FIG. 6.—DRUMLINOID 3¼–4 MILES ABOVE VESTAL IN CHOCONUT CREEK VALLEY. SCALE, 2 IN.=1 MILE.

Another smoother, rounder hill occurs a mile farther up stream fairly well separated from the west valley wall but not close enough to the other to crowd the stream; hence there are no stream cuts in it. However, appearance and tradition, the only evidence available, agree that it is not a rock hill. Close to it and to the north is a small rounded hill with its largest and highest end to the south.

A mile above the last large one is the most regular hill found. (See Fig. 6.) Its relation to the valley is all told by the figure. A well dug at X in Fig 6 is said by the owner to be 25–30 feet deep, but no rock was encountered. If this hill were in a drumlin region it would unquestionably be called a drumlin.

Near the head of a stream entering the Nanticoke at Union Center from the west are two of the smallest examples found. They are 600–800 feet long and about 500 feet wide. Both present good till cuts where attacked by the stream. In another west branch of Nanticoke Creek, some three miles north or northeast of the village of Maine, is a hill with a four-crested summit. The hill is about 1,200 feet by 700 feet, and 50 feet high, well separated from the valley wall and certainly mainly composed of till. There are a number of forms of questionable character in this vicinity.

Still others in Apalachin and adjacent sheets show similar features. Pipe Creek on the Owego sheet, mapped by Professor Tarr, has many. The largest is 60 feet high and three-fourths of a mile in length and stands out into the valley, deflecting the stream. This one is higher and steeper on the north end. There are several stream cuts in it, one 20 feet high, but none reveal rocks. Superimposed on the south end of this larger one is a smaller hill which stream dissection has cut almost in half, exposing only till. Northwest of Straits Corners is the only hill in this valley bearing morainic topography.

At the northeast corner of the Folio but just off into the Cortland quadrangle is a small example of drumlinoid composed chiefly of stratified gravel and sand. So well stratified is the deposit that it has been opened and the sand and gravel drawn away for local use. This is the only drumlinoid reported in the entire Catatonk Folio region with more than traces of stratification.

In the southern half of the Folio the valleys are deeply filled with till and stream deposits, often partly stratified. As a rule this filling lies smoothly in the valley with a narrow trench, of post-glacial development, cut through it; but sometimes bunches of till with little sags behind them cling to the valley sides. Many examples of this class have been half or more cut away by the stream, revealing thick till accumulations. Some of these occur in valleys where the more perfect drumlinoid hills are. By search throughout the whole Folio area examples may be found constituting a series, which passes by small gradations, from the thickened hump of till half removed and easily denominated valley filling, to the well-formed and perfectly preserved drumlin-shaped hill shown in Fig. 6.

There are numbers of forms whose true nature has not been proved. Some of these may be rock, but where they stand out well into the valley, I cannot see how a rock hill could be preserved except in rare accidents or very special conditions. But

one example of an authentic rock hill lying in a valley is known in the entire area, and that is a large one near Union in the Susquehanna valley. This hill is several times as large as any of those above described, and its slopes are as steep as, or steeper than, the valley walls in this vicinity, while almost without exception the till hills have much gentler slopes, and hence appear more mature than the proximal valley walls. (See sections and maps.)

Summing up the data presented in the above descriptions the following facts may be stated:

1. About seventy-five, more or less, rounded hills occur in the valleys of the Catatonk Folio.

2. Many of these have been proved by stream cuts and well sections to be composed of unstratified till. Only one is known to be essentially water laid.

3. Some of these hills blend with the valley wall with no definite sag between, some have a well-marked col, and some lie out in the valley free on both sides.

4. Many are so situated as to cause the valley to narrow and widen, and the stream to flow alternately over a broad flood-plain and in a narrow gorge, frequently in the latter case to be obliged to cut a rock channel past the obstruction.

5. The drift hills vary in length from 200 to 1,300 yards; in width from 200 to 900 yards, and in height from 20 to 100 feet.

6. They are usually somewhat elongated, but vary from circular in outline to an axial ratio of 2:1. Where elongated the long axis is usually parallel with the valley in which they lie; in a few cases it extends crosswise of the valley.

7. Rarely are they found in any but approximately north and south valleys, and they seem to lie predominantly in valleys trending a little N.W.–S.E., or approaching a right angle to the direction of ice movement; a few doubtful ones, however, are in the Susquehanna valley; they are known in valleys of all sizes, but are best developed in those of moderate size.

8. Usually the surfaces are smooth and rounded, but in a few instances more or less of the surface is morainic in character. This last seems to occur more frequently on the south end, or on the flank lying nearest to the valley wall.

9. Many half and other fractional forms occur, which fact suggests that the streams have in part destroyed them, and many fractional forms blend more or less smoothly with the ordinary valley filling, suggesting that it is the partly-formed variety which is most easily removed. This is probably due to the lack of ready-

made channel-ways around them when the streams first begin to flow through the ice-evacuated valley.

10. They are grouped in valleys. Rarely is one found alone, but frequently 3 to 8 or 9 in a single valley. They are not reported from the upland, and probably do not occur there, although the difficulty of identifying them and distinguishing them from purely erosion rock forms where stream cuts are rare may have caused an occasional one to be overlooked.

11. A few of the described forms show terminal differentiation, being a little larger or a little higher at the north end; a smaller number show a similar enlargement at the opposite end, but most of them have a maximum height in their central portions.

Theories and explanations. Four hypotheses have been considered in the attempt to explain these interesting features:

First, that they are rock forms and due probably to preglacial erosion; second, that they are morainic loops modified in many cases by stream action; third, that they are over-ridden moraine; and fourth, that they are valley-filling or morainic masses carved or built by ice into drumlin-like forms.

In the early stages of the study the first hypothesis was frequently resorted to, thinking that the hill in question each time was a smaller but similar example of the rock type seen at Union; but it soon became apparent that there was another type. Stream cuts presented the first evidence, and then the well records were sought until it became very evident that many of the forms were of till. Rarely was any evidence found that a suspected hill was of rock. That others whose internal structure is unknown are of the same character, namely, of till, is believed to be true, for two reasons: (*a*) The fact that they lie out in the valleys, thereby narrowing down to a gorge an otherwise broad, mature valley; (*b*) That their slopes, except those recently undercut, are very much more mature than those of the valley walls. It seems probable that if these hills were rock remnants they would possess as steep slopes as the valleys, and possibly often steeper slopes, because in such close proximity to the stream. This should be expected even though they have not been postglacially attacked by the streams.

When it was discovered that the rounded hills were largely composed of till the second hypothesis was proposed, and in support thereof a number of points may be adduced. Sometimes the hills lie almost across a valley save for a narrow postglacial gorge; they predominate in north-south valleys; in two places small loops were found crossing valleys in the southern part of the Folio, and such

loops had become very familiar in the northern part and in the adjoining Watkins Glen Folio.* But if this be their explanation a halt of the ice-front sufficiently long to build such moraines ought to have been sufficient to construct some sort of a moraine on the valley side and to lay down washed gravel in the valleys beyond the loop. Repeated diligent search failed to reveal either moraine or gravel. No possible morainic connection has been found in any case leading away from the drumlinoids along the valley sides. In fact, in the whole southern portion of the Folio where the types are best developed no systematic moraine was found. Further, except in rare cases there has not been found characteristic morainic topography in any of the drumlin-like hills.

As the third hypothesis was developed the suggestion came that the peculiar feature might stand for over-ridden moraine—*i. e.*, moraine made by halts during the advance of the ice or, perhaps, during an earlier advance. There is, however, at present no recognized evidence in this vicinity of an earlier advance.† The facts that the hills in question are composed of till, that they are in the north and south valleys, and that they are generally smoothed forms, lend colour to the suggestion; but it seems probable, as in the consideration of the previous hypothesis, that, if it be moraine, with so great accumulations in the valleys there should be moraine on the valley slopes as well. Provisionally it may be answered that the hill moraine would certainly be weaker than that of the valley, and therefore may have been more completely wiped away by the ice. However, not only is there no moraine on the valley sides but there is no trace even of over-ridden moraines. It may be possible that hill moraine could be completely brushed away by an ice invasion, and hence that this explanation may account for the presence of the drumlin-like masses in the valleys as unremoved remnants of moraine; but it seems much more probable that the forms in the valley, above which the ice was thicker and heavier, would be wiped off before those in the upland, beneath less of a burden. Further, moraine deposits are very complex, while this material is almost universally very simple and homogeneous in structure. Hence, the author was led to the conclusion that the theory of over-ridden moraine was scarcely adequate to account for all the phenomena.

There is, in practically all the valleys of the Folio, a large quantity of till which has apparently been brushed in by the ice.

* Bull. Geol. Soc. Amer., Vol. 16 (1905), No. 10, pp. 215–228, and U. S. G. S. Watkins Glen Folio (in press).

† *Ibid*, p. 217.

This material throughout the whole study has attracted much attention and has been the source of constant study. It is till, often containing large angular boulders of the country rock as well as foreign material, and is usually smoothed into the valley to considerable depths. In many valleys this drift is somewhat bunchy. Sometimes it is deeply trenched by the main stream and even by valley side-rills. It sometimes presents rounded forms into which the streams have cut deeply, and, as stated on a previous page, there are all gradations in form and size—from the little, insignificant bunches of valley filling half or more eroded to the large, complete drumlin-like hill. This suggested a fourth hypothesis—namely, that the peculiar forms are a consequence of ice building or carving in this thickened deposit of till. As points in its favour are brought forward: (*a*) The relation of so many of the forms, distinctly drumlinoid, to the typical valley filling; (*b*) the gradational series from ordinary bunched filling to the typical drumlinoids; (*c*) the absence of morainic connection on the valley walls with the drumlinoids (of course, if the valley hills are carved from the valley filling no upland moraine need have existed); (*d*) the absence of examples in the uplands, cirques, and higher valleys, where, if formed from moraine, certainly some forms should be. This hypothesis may not apply to all forms described above, as, for example, that shown in Fig. 3, but it may well explain such forms as that of Fig. 6. The wholly unstratified and homogeneous structure of all drumlinoids, save one, whose interior arrangements have been seen, argues very strongly against the second alternative in this hypothesis. The presence of some stratification in the Rochester-Syracuse drumlins may point to a constructive process for their origin, but the absence of bedding and the homogeneity of texture lead strongly to the belief that these drumlinoids were carved out of pre-existing deposits rather than that they were built up by successive additions.

The striking resemblance of some of the better specimens of drumlinoids of the Catatonk Folio to the drumlins of the Rochester-Syracuse, northern Michigan,* or Wisconsin† drumlin areas, suggests a community of origin, and yet the distribution is extremely different. Drumlins have usually been found in extensive groups and in regions of otherwise weak relief. Here we have them scattered widely, two or three to eight or ten in a valley, with long stretches of country between them and in a region deeply

* Russell, I. C.—Amer. Geol., Vol. XXXV. (1905), No. 3, pp. 177–9.

† Chamberlin, T. C.—Geol. Surv. Wis. Vol. I., p. 283; Jour. Geol., Vol. I. (1893), pp. 255–267. Upham, W.—Amer. Geol., Vol. XIV (1894), pp. 69–83.

and maturely dissected. It is because the forms present so many similarities to drumlins and yet differ from them in these several respects that the name drumlinoid has been given them.

They may represent a new phase of the drumlin and emphasize further the belief that we are at present including under the term drumlin several distinct forms with perhaps as many origins. Since our drumlinoids are apparently due to ice erosion in soft till, mainly valley filling, this study may be a contribution to the general problem of the origin of some of the drumlins of the more classic areas.

NOTE.—I have noticed in some of the Swiss topographic maps the description of forms in the Swiss valleys similar to these drumlinoids which offer an inviting field for study, and possibly present material which when studied will yield a valuable contribution to the present problem.

OHIO STATE UNIVERSITY.

THE LEARDO MAP OF 1452.

Giovanni Leardo was a Venetian cosmographer, who lived in the fifteenth century and remained unknown, except by name and tradition, for four hundred years.

In 1850 Signor Vincenzo Lazari discovered in the Museum of Vicenza a planisphere, or map of the world, which bore the signature: *Johanes Leardus de Venetiis me fecit ab anno domini 1448.* Lazari sent a description and a drawing of the map to Santarem, who published the description, with critical remarks, in his *Essai sur l'Histoire de la Cosmographie, etc.* (Tome 3, pp. 398-442), and printed a facsimile of the drawing in his Atlas.

In 1879 Friedrich von Pilat, Consul-General for Austria-Hungary in Venice, purchased from a private collection in that city a map of the world on parchment, with the inscription:

Johanes Leardus de venetteis me fecit abano domini 1452.

A description of this map was read before the R. Instituto Veneto di Scienze, Lettere ed Arti in 1880 by Dr. Guglielmo Berchet*, and printed in pamphlet form the same year by Ferdinando Ongania, of Venice, to accompany the photographic reproduction of the map in the Collection of Italian Charts and Maps of the Middle Ages published by him. The parchment on which the map is drawn is 60 centimeters wide (23⅝ in.)

* The facts here given are taken from Dr. Berchet's paper.

and 73 centimeters from top to bottom (28¾ in.). At the top is the chevron of the Trevisan family.

At the bottom of the parchment a strip, 3½ in. high, contains the legend, with the signature of the author and the date.

Above this strip is a parallelogram, enclosing ten concentric circles drawn around the map, which occupies the centre.

The inscriptions are not easily read, the writing having faded in many places and the parchment having suffered in others.

The legend begins with a reference to the Creator and the Passion, and then gives the diameter of the earth, "according to the excellent astrologer and geometrician Macrobius," as 6,857 miles, which happens to be not far from the actual measurement of 6,876 nautical miles.

Leardo then gives the diameter of the Moon, of Mercury, Venus, Mars, the Sun, and Saturn, as well as that of the universe and the crystal sphere; all wholly fanciful.

The innermost of the ten circles shows Easter Day for 95 years, beginning with 1452.

The second circle marks the months of the year, with the signs of the zodiac.

The third circle gives the phases of the moon, according to the cycle of 19 years, distinguished by 19 letters of the alphabet.

The fourth circle is that of the days of the months.

The fifth circle is that of the hours.

The sixth circle is that of the *points* of the hours; each hour being divided into 1080 points, or instants.

The seventh circle gives the dominical letter.

The eighth circle gives the length of the days throughout the year, and in the ninth the variation from day to day is marked.

The tenth circle contains the name of the titular saint for each day of the year.

The map drawn within these circles is 15¾ inches in diameter. The east is at the top of the map and the south at the right hand of the observer.

Jerusalem is in the centre. The earth, which is quite symmetrical, is surrounded by the sea. The Gulf of Guinea on the west and a similar gulf in the east under the same parallel through Africa form pendants to two smaller gulfs in the north, the Baltic and the Sea of Okhotsk.

The names of the continents are written in red on a white ground and the islands are in red and yellow, with the exception of Ireland and England, which are green.

Europe contains 47 cities, Asia 75, Africa 74 and Ceylon (Taprobane) 4, all coloured green and red. Mountains are barely indicated; the seas are blue, except the Red Sea, which is deep red; the lakes are blue, yellow, and rose, and the rivers green and blue.

Latitude and longitude are not marked. The Mediterranean is made too long and the western coast of Europe is badly drawn, but Scotland and England form one island. The Scandinavian peninsula has a western inclination and the northern parts of Europe and Asia are depicted as *the desert uninhabited on account of cold.*

In Asia, Corea, China and India are incorrectly shown and without Japan and Formosa. On the far eastern coast a castle with two towers marks the site of the Terrestrial Paradise.

In southern Asia the Indian peninsula is less incorrect than in the Bianco map, and a noteworthy progress in knowledge is the disappearance of the great gulf between India and an eastern prolongation of Africa, still found in Bianco. With this gulf disappear also the traditionary twelve thousand islands of Marco Polo.

The southern part of Africa is a work of pure fancy, painted a fiery red beyond a band which divides the inhabited part from the *desert uninhabitable because of heat.*

The Gulf of Guinea is made mediterranean, and on the Atlantic coast of Africa the Canary Islands are shown, with the first Portuguese discoveries.

The Black Sea is fairly well drawn, though it is in the latitude of England; the Caspian has much the same shape as the Black Sea, but it is correctly shown as a closed sea and without the supposed communication with the Icy Ocean. The Red Sea, as in all the older maps, makes an angle towards the east, but it is made to begin east of Jerusalem, almost at the point of commencement of the Persian Gulf, and it reaches to Cape Guardafui. No account is taken of the strait of Bab-el-Mandeb.

There are two Niles. One flows from Ptolemy's Mountains of the Moon; the other branches from the first, forms various lakes and finds its way to the Atlantic.

The rivers are badly drawn, but less so than by Bianco and preceding cosmographers.

Leardo, like others of his time, finds place in his map for the legends current in the Middle Ages. Almost under his Terrestrial Paradise are three inscriptions: *Here they eat human flesh;* and

to the left: *Desert where there are many griffins;* and on the right: *The Thirty Days' Desert* (possibly the Desert of Gobi). Farther north, near the line of the frozen region, is a turreted temple, with the legend: *This is the sepulchre of the Great Khan, and they do this: when he is borne to his burial, he comes accompanied by many armed men, who kill those whom they meet on the road, and they say that the souls of these persons are blessed because they go with the soul of the Great Khan to another life.*

North of Scandinavia Leardo puts *the people who do not see the sun for four months in the year;* and south of Ethiopia we find the empire of Prester John and these two inscriptions: *Here are four-footed animals with human faces;* and *Here are men with faces in their breasts.*

This most interesting map was acquired in April of this year by a member of the Council and presented to the American Geographical Society.

GEOGRAPHICAL RECORD.

AFRICA.

RUWENZORI PEAK REACHED.—Almost simultaneously with the arrival in Mombasa of the Duke of the Abruzzi and his party on their way to attempt the ascent of the Ruwenzori range, the *Geographical Journal* of the Royal Geographical Society (May, 1906) announces that Mr. Rudolf Grauer, an Austrian, with the Messrs. H. W. Tegart and H. E. Maddox, members of the Church Missionary Society in Uganda, have reached one of the peaks of the Range. On Jan. 18, their camp was just below the Mubuku glacier; and as they had to return to camp every night, three days elapsed before they were able to reach the peak, which they named King Edward's Rock, the top of which is about 15,070 feet above sea-level. They were much delayed throughout their work by fogs. In their opinion, the highest peak of the range is the one to which Sir Harry Johnston gave the name Duwoni. It is not far from King Edward's Rock, and they believe it is not over 16,500 feet high. They say that this culminating point of the range can be ascended if the porterage difficulty is overcome, so that provisions may be brought up and camp established at the base of the peak, where the climbers may wait for favourable conditions of weather.

COLLECTING EXPEDITION TO BRITISH EAST AFRICA.—The *Journal* of the American Museum of Natural History (April, 1906) says that Mr. Richard Tjader, a traveller and hunter of wide experience, accompanied by Mr. Herbert Lang, one of the Museum preparators, left New York on March 1 on an expedition into British East Africa (Uganda) for birds and mammals, particularly the large mammals of the region, for the Museum collections. The

party will land at Mombasa on the east coast and proceed thence by railroad to Nairobi. From Nairobi advance will be made by a circuitous route northward, westward, and southward to Port Florence on Lake Victoria, whence return to the coast will be made by boat and rail. The expedition has been provided for through the generosity of Mr. Samuel Thorne.

NAIROBI ON THE UGANDA RAILROAD.—Major Wangermée, Vice-Governor of the Congo Free State, describing his recent journey over the Uganda railroad, in the *Mouvement Géographique* (No. 16, 1906), says that Nairobi, the most important town on the line west of Mombasa and about half way between the Indian Ocean and Victoria Nyanza, stands at an elevation of 5,450 feet, the altitude assuring a comparatively temperate climate, which permits the cultivation of many varieties of European fruits, cereals, and vegetables. The European population is therefore increasing, and the white colonists, who have brought their families to Africa, have no desire to return to the mother country. As the train stops at the station, a considerable number of carriages and wagons are seen waiting for passengers or baggage. These conveyances are drawn by one, two, and even four horses. A number of English women come down to the station to await the distribution of the European mail. The town is planned on a large scale, and has a European quarter, where over 500 whites are living, and other distinct quarters for the Hindus and the negroes. Most of the houses and all of the railroad buildings are of galvanized iron, and even the chicken and dog houses are of the same material. An agricultural society is studying the best methods of cultivation and the kinds of useful plants and animals that will thrive best in that region, and is spreading this information among the colonists.

THE KHEDIVE VISITS THE OASIS OF SIVA.—The Khedive has just made an interesting journey to Siva, on the border between Tripoli and Egypt. He left Alexandria on Feb. 11 with four European companions and an Egyptian secretary, and reached the oasis nine days later. After having covered most of the way through the desert, about 325 kilometers, in seven days, camp was pitched five kilometers from the oasis, which was entered two days later. Five days were spent in visiting the fertile fields and gardens and talking with farmers and merchants as to the needs of the region and the best means of developing its resources. The oasis grows a large number of date-palms and olives, besides many fruit trees, some of which, like the apple, are scarce in Egypt. There are numerous brooks, but they are poorly utilized, and their waters are permitted to form unhealthful swamps. The Khedive returned to Alexandria on March 6.

EXPLORING EXPEDITION TO LIBERIA.—Dr. Walter Volz, Lecturer in Zoology in the University of Bern, will head an exploring party that is to be sent into the practically unknown hinterland of Liberia. This Great Forest region, which has been penetrated far east only by one or two explorers, will this time be approached from Sierra Leone. The funds have been supplied by the geographical societies of Switzerland, and the purposes in view are as much commercial and industrial as ethnographical and geographical. The scientific collections are to become the property of various Swiss museums.

SCIENTIFIC RESEARCH IN THE GERMAN AFRICAN COLONIES.—The *Zeitschrift* of the Berlin Geographical Society (No. 7, 1905) says that it is intended to place

the investigation of the geography of the German African colonies upon a systematic basis. A year ago a committee was appointed to inquire if more scientific results might not be obtained by the concentration of effort in one organization, instead of spreading the work of investigators among several channels, as has heretofore been the practice. The Committee has recommended that the detailed study of geography hereafter be carried out by stationing scientific observers at the Government posts by attaching them to expeditions and similar methods. The scope of their researches is defined as embracing "all departments of scientific knowledge that relate to the earth's surface and to its vegetable, animal, and human inhabitants."

DISTRIBUTION OF THE NEWTOWN PIPPIN.—The *Agricultural Journal* of the Cape of Good Hope (April, 1906) says that the Newtown pippin is recommended as a good variety to plant in South Africa, as it has been proved to thrive there. California is shipping Newtown pippins gathered in October and November to London, where they arrive in splendid condition, and may be kept in cold storage until the following March. The *Journal* says that this apple may be grown in South Africa in large quantities and shipped to England at a good profit.

About 200 years ago a seed from a roadside apple tree in the township of Newtown (Long Island), now a part of the City of New York, dropped into the edge of a swamp, and the tree that sprang from it was the original Newtown pippin. Grafts from this tree and its descendants have spread the fruit through parts of New York State, the middle Atlantic States, and along our Pacific coast, but the fruit does not yield its best results in the New England States. It has always been very popular in European markets as one of the best imported apples. The news that this famous apple is thriving in South Africa is an interesting illustration of the wide distribution of a commodity.

AMERICA.

TELEGRAPH LINES IN ALASKA.—It is announced from Washington that many changes in the telegraph lines in Alaska are in contemplation by the Signal Corps. The lines extending inland from Valdes to Eagle City and then down the Yukon to St. Michaels are very crooked, as it was thought best, owing to the roughness of the country, to stretch the pioneer wires along the streams. It is now the purpose to straighten these lines and shorten them wherever possible. The duplex system is to be introduced on the Alaskan cables, increasing their capacity about 75 per cent.—an important improvement, as the operators have difficulty now in handling all the business offered.

NEW BUILDING FOR THE GEOLOGICAL SURVEY.—A bill was introduced in both houses of Congress in March to appropriate the money required to erect a new building for the U. S. Geological Survey. The working force numbers nearly 2,000 persons, of whom half are employed only in summer. About 600 are engaged during the winter months in office work at Washington. The two buildings rented in that city for accommodation are so inadequate that even the corridors have to be utilized for desk space and map cases. Some employees are permitted to work at home for lack of proper office facilities, and others are housed in the National Museum and Smithsonian Institution. *Science* says (No. 594) that "Chemists, physicists, photographers, petrographers, draftsmen, engravers, lithographers, and other specialists must have room for their instru-

ments, working specimens, drawings, lithographic stones, presses, etc." The degree of crowding to which the office force is now subjected diminishes the quantity and depreciates the quality of the work.

The rented buildings, moreover, are not at all suitable for some purposes of the Bureau. About twenty-five rooms in the main building are so dark that work can be done only with the aid of artificial light. Forty-five persons are working all day in the largest of these rooms with the help of electric light. The delicate physical apparatus is constantly affected by the vibrations of the heavy printing-presses. The buildings are not of modern fire-proof construction, and Government property and records, estimated to be worth $6,000,000, are in constant danger of loss by fire. The Survey needs a strong, fire-proof, well-lighted building containing a net available space of at least 150,000 square feet, exclusive of basement and halls. Such a building would cost about $1,200,000, and the annual rent now paid on the buildings occupied is nearly three per cent. on that amount.

U. S. Waters that Reach Hudson Bay.—All the waters that reach Hudson Bay from the United States pass through Lake Winnipeg and thence into the bay through Nelson River. The two principal tributaries of Lake Winnipeg, and thus, indirectly, of Nelson River, are the Saskatchewan and the Red River. The Saskatchewan drains the major portions of the provinces of Alberta and Saskatchewan and the northwestern part of Assiniboia, in the Dominion of Canada, and, through St. Mary River, a small area in northwestern Montana in the United States. The Red River drains a large basin in the United States, covering portions of Minnesota and North and South Dakota. Both rivers are large and important.—(*Water Supply and Irrigation Paper,* No. 171.)

Hydrographic Work of the U. S. Geological Survey.—This work includes the collection of facts concerning the behaviour of water from the time it reaches the earth as rain or snow until it joins the oceans or great navigable rivers. These investigations became a distinct feature of the work of the Survey in the fall of 1888. The first specific appropriation for gauging streams was $12,500 in 1894. The appropriations have been gradually increased until, for the past four years, they have been $200,000 annually. The chief features of the work are the collection of data relating to the flow of surface waters and the study of the conditions affecting this flow. Studies are also made concerning river profiles, duration and magnitude of floods, water-power, etc. This work includes the study of the hydrography of every important river basin in the United States, and is of direct value in the commercial and agricultural development of the country. About 800 regular gauging stations were maintained in 1905, and the results of the work are published in a series of fourteen "Water Supply and Irrigation Papers" (Nos. 165 to 178).

Dr. Gilbert and the San Francisco Earthquake.—Dr. Gilbert, of the U. S. Geological Survey, was in the neighbourhood of San Francisco at the time of the recent earthquake. Instructions were at once sent to him from Washington to make as thorough a study as possible of the earthquake phenomena. He has been engaged for some time in making hydraulic experiments in the mining laboratory of the University of California at Berkeley.

Progress of the Reclamation Works.—Mr. F. H. Newell, Chief Engineer of

the U. S. Reclamation Service, has returned from an inspection of the works now under construction in Oklahoma, New Mexico, Arizona, California, Nevada, Utah, Colorado, and Kansas. The expenditures on the water storage and distribution systems are now aggregating about $1,000,000 a month, and in its magnitude the work is now among the first of public undertakings. Most of the large engineering problems have been worked out, and the activity on the more expensive undertaking is now at its height. The present rate of construction and expenditure is at its maximum, and will gradually decrease.

Geological Work in Iowa.—The Iowa Geological Survey, during the past year, has been investigating the peat deposits of the State, and has published the results in a preliminary report. A member of the staff has continued investigations of the coal deposits, both stratigraphical, areal, and in the matter of coal tests. This work will be published as a monograph when it is completed. Another phase of the work now in progress is a study of the quarry products of Iowa, including lime, cement materials, etc., with tests of them. This work, also, will be published separately.

Kansas State Geological Survey.—The University Geological Survey was organized by the Board of Regents of the University of Kansas in 1894. In 1897 the State Legislature recognized this organization, and has regularly made appropriations for it at each session of the Legislature since that date. It has been provided that the Chancellor of the University should be *ex-officio* Director of the Survey, and the Professor of Geology of the University should have immediate charge of the Survey and should be State Geologist.

Volume VIII, containing the report on lead and zinc, is now being distributed. The appropriation bill for 1905 provided for the publication of a special report on oil and gas and also for an annual report on the mineral resources of the State.

The field work during 1905 was confined principally to investigations in connection with the report on oil and gas. Detailed stratigraphic work on the coal measures of the State was practically completed, and during the past winter maps of them have been prepared. Data were gathered last year and arranged for publication on the production of lead, zinc, coal, oil, gas, Portland and hydraulic cement, gypsum, salt, clay products, building-stone, and sand. Extensive investigations on roadbuilding material are now under way, and tests are being made on Kansas lime and sand for making sand-lime-brick.

Climatic Centres and Centres of Plant Distribution.—In a recent number of the *American Naturalist* (Vol. XXXIX, No. 468, 1905, pp. 875-889), Edgar N. Transeau brings out the results of a study of the centres of plant distribution in relation to climatic conditions. Investigation has shown that forests, grass-lands, and deserts are arranged about certain climatic centres, the term "centre" not implying that the plants have necessarily spread from these regions, but that the most favourable climatic conditions for any special type of vegetation are here localized. In departing from these centres these conditions become more and more unfavourable. The author finds that if the ratios produced by dividing the amount of rainfall by the depth of evaporation for the same station be plotted on a map, they exhibit climatic centres corresponding in a general way with the centres of plant distribution. Moreover, the distribution of grassland, prairie, open forest, and dense forest regions is clearly indicated. This is believed to be explained by

the fact that such ratios involve four climatic factors of the greatest importance to plant life—viz., temperature, relative humidity, wind velocity, and rainfall. An interesting map of eastern North America shows the ratio of rainfall to evaporation, expressed in percentages.

The method suggested by Mr. Transeau is a novel one, and the relations which he has worked out are suggestive. Unfortunately, the whole matter of evaporation measurement is in a very uncertain and unsatisfactory state—a fact which the author clearly recognizes—and the relation between actual evaporation and possible evaporation has not been generally appreciated. Nevertheless, the conclusions reached in this paper are certainly interesting and important, and deserve attention. The Great Plains are marked by a rainfall equal to from 20% to 60% of the evaporation called for. The prairie region is indicated by a ratio from 60% to 80%. Here forests are confined to the low grounds. Between 80% and 100% is a region more or less coincident with "open forests," "groves," and "oak openings" on the uplands and dense forests on the low grounds. The deciduous forest centre in the southeast corresponds with the area of from 100% to 110% of ratio between rainfall and evaporation. The distribution of ratio above 110% in the coastal plain is similar to the position of the southeastern conifer centre. R. DEC. W.

FOREST PLANTING IN OKLAHOMA.—*Bulletin* No. 65, Forest Service, by G. L. Clothier, gives *Advice for Forest Planters in Oklahoma and adjacent Regions.* The Forest Service has for several years past been co-operating with farmers in making forest plantations in that district, and the information given in this *Bulletin* was collected by agents of the Service chiefly in connection with the making and execution of these plans. A large part of this region is practically without natural forests, and but a small part can grow trees without cultivation. The rainfall decreases from over 38 inches annually in the southeast to less than 12 inches in the northwest; but the soil is very fertile, and there is no doubt that, by means of a careful selection of species, the choice of suitable situations, and the proper management of the plantations, useful forest trees may be grown in every county of the region. Success in tree-planting on the plains, where rainfall is light and irregular and where evaporation is great, depends very largely upon proper tillage of the soil, careful directions for which are given. On the plains, also, a windbreak of forest trees must be provided on the south and west sides of the planting site, and is advisable, though not essential, on the north. The primary object of the windbreak is to shelter the orchard or a residence site, and to prevent hot winds from scorching the field crops. Valuable material may be furnished by the windbreak, but on the plains of eastern New Mexico and western Texas it must be a permanent feature of the farm, and must be maintained for its protective effects rather than for its product of wood. Several planting plans are described and illustrated; a good map of the region, showing rainfall and the silvical belts; and several half-tone illustrations of the results of planting accompany this Report. R. DEC. W.

FOREST BELTS AND CLIMATE IN KANSAS AND NEBRASKA.—*Bulletin* No. 66, Forest Service, by Royal S. Kellogg, deals with the *Forest Belts of Western Kansas and Nebraska,* embracing the territory in Kansas and Nebraska west of the ninety-ninth medidian, and in Colorado east of the one hundred and fourth meridian. The climate of nearly all this region is essentially semi-arid, with light rainfall, unevenly distributed, high winds, excessive evaporation, and great fluctuations

of temperature. These conditions become more marked from east to west, and are clearly reflected in the character of the forest growth and in the gradual disappearance of tree species. At Hays, Kans., the mean annual rainfall is 20.9 inches. At Wallace, due west of Hays, near the Colorado line, it is 16.1 inches. The average precipitation at Kearney, Neb., is 25.8 inches; at North Platte, 17.7 inches; at Gering, 14.8 inches. These places are on the Platte River, and clearly illustrate the increasing aridity towards the west.

The fluctuations in rainfall from year to year, and the irregular distribution through the year, are of more importance to forest growth than the mean annual amount. During thirty years at Dodge, Kans., the driest year gave 10.1 inches, and the wettest gave 33.7 inches. If the average rainfall at Dodge, 20 inches nearly, were constant and well distributed, it would suffice for the growth of many species of trees, but, as it is, the species actually found there are those which can endure a year with a rainfall of only 10 inches. This is likewise true throughout the plains region. Evaporation on the plains is much increased by the high winds, which cause at least four times the evaporation that would be found in a calm. The spring winds are especially high. The prevailing wind is northwesterly in winter and south to southwest in summer. The rainfall, as just noted, decreases from east to west; but evaporation increases, so that there is a rapid decrease westward in the amount of moisture available for plant life.

It results, naturally, from these conditions that the common hardwood trees are confined chiefly to the water-courses or comparatively wet locations. There is not sufficient subterranean water for all species, and the excessive evaporation limits plant distribution. The evaporation from leaves may be faster than the supply of water obtained through the roots, even when the latter are in very moist soil. In seasons of severe drought trees are killed. Climatic conditions, without question, are the limiting factors in the distribution of the tree species belonging to the valley type. Any factors which check wind movement and decrease evaporation render conditions of tree growth more favourable. Thus, cañon sides facing north, and hence less exposed to summer winds and the intensity of summer heat, are often covered with small trees and shrubs, while the opposite side of the same cañon contains hardly any woody growth. North and northeast slopes throughout this region are more favourable to tree growth of every kind than are other slopes or open levels.

The natural forest growth in Kansas and Nebraska is limited to the river courses and a few upland areas of pine and cedar. The valley type is the common forest type, composed mostly of broad-leaf species, and in the western part of both States confined closely to the water-courses. These broad-leaf species need more water than the conifers, and there is no good growth of them anywhere, except where the roots can reach nearly to permanent water. A good map of the forest distribution in western Kansas and Nebraska accompanies the Report. R. DeC. W.

The Coon Butte Meteorite.—A meteoric stone was found by Mr. D. M. Barringer in June, 1905, not far from Coon Butte, Ariz., which is described by Professor Mallet in the *American Journal of Science* for May. The aërolite was lying on the surface of the thin soil which covers the level limestone plain, the greater part of it being exposed to view, as it was imbedded in the soil only about an inch. Two broken corners were exposed to view, and the fractures exhibited seemed to be quite fresh. Mr. Barringer inferred that these corners were broken off at the time of the fall. No fragments were found; and it is believed

that the stone struck the earth at some distance from the place where it was found and bounded to this spot. Mr. Barringer thinks it highly probable that this aërolite was seen to fall by two different parties of observers about the middle of January, 1904.

MOUNT MCKINLEY.—Dr. F. A. Cook of Brooklyn will make another effort, this summer, to reach the top of Mount McKinley, the highest American mountain. He will be accompanied by Professor H. C. Parker of Columbia University, who has had much mountaineering experience. They have taken with them a number of assistants. Dr. Cook's first attempt to ascend the mountain was described by him in the BULLETIN (No. 6, 1904).

TIDES ON THE PACIFIC COAST OF CANADA.—A report by Mr. W. Bell Dawson, the engineer in charge of the Canadian Tidal Survey, on "Tide Levels and Datum Planes on the Pacific Coast of Canada" has been published by the Government (Supplement No. 1 to the 38th Ann. Rep. of the Dep. of Marine and Fisheries). It will be remembered that the tidal survey on the Atlantic side has been in progress for some years under Mr. Dawson's direction, and that the results have enabled the Marine Department to issue tide-tables for most of the principal ports. The levels which a continuous record of the tide affords are valuable not only for marine purposes but also for reference in the construction of wharfs, dredging, and other harbour improvements, and in city works.

The survey has now been extended to the Pacific Coast. The report says that the bench-marks and data used by the Admiralty and the Hudson Bay Company, in various towns on the coast, have been connected by levelling, and the bench-marks of Victoria, Esquimalt, Vancouver, and other tidal stations referred to one common standard. These levels are printed in the report.

While in the North Atlantic the tides are found to be chiefly influenced by the moon's phases, those of the Pacific have a pronounced diurnal inequality, which accords with the declination of the moon, and is also subject to an annual variation with the change in the declination of the sun. The solar influence is unusually large in the Pacific relatively to the lunar influence, and the annual variation is thus the more accentuated.

On some parts of the coast, during the greater part of the day, there is a long stand or only a slight fluctuation near high-water level, with a sharp, short drop to low water, which occurs once in the day. Owing to this diurnal inequality the two highest and lowest points in the tide-curve for the month may be as much as five days before or after the full and new moon. While the tides on the Atlantic side of Canada follow the phases of the moon, and accordingly the alternations of spring and neap tides are the dominant features, the tides on the Pacific side may be described as declination tides.

THE FIFTEENTH INTERNATIONAL CONGRESS OF AMERICANISTS, QUEBEC, 1906. The preliminary programme, issued in May, defines the subjects to be considered:

(*a*) The indigenous races of America, their origin, their geographical distribution, their history, their physical and intellectual characteristics, their languages, their civilization, mythology and religion, their manners and customs.

(*b*) The indigenous monuments and the archæology of America.

(*c*) The history of the discovery and the European occupation of the New World.

The languages of the Congress are French, English, German, Spanish and Italian.

Members are requested to forward to the Secrétaire Général, as soon as possible, the *titles* of their papers. The author of each communication registered in the programme must send in, before July 1, 1906, a summary to be printed in the daily Bulletin of the Congress.

Thirty-nine papers are already inscribed.

Details concerning receptions, excursions, etc., will be given in a subsequent programme.

The museums and libraries of Quebec will be free to the members of the Congress.

The membership fee is Three Dollars.

All correspondence is to be addressed to

Dr. N. E. Dionne,
Secrétaire général.

The Geological Survey of Canada.—Some changes have recently been made in the organization of this Survey. For more than five years Dr. Robert Bell has been the Acting-Director, and has managed the business of the office as well as its scientific affairs. Mr. A. P. Low has now been appointed Director of the Survey and Dr. Bell has received the title of Chief Geologist of the Dominion. Dr. Bell will continue to prepare his reports, maps, and other work, but will be relieved of the large amount of routine involved in the management of the Survey. Since this began, sixty-three years ago, about 470 maps have been prepared and issued, and nearly one-third of this number has been published during the last five years.

Dr. Koch-Grünberg in the Upper Rio Negro Region.—Dr. Koch-Grünberg recently returned from the region of the upper Rio Negro, a part of the northern Amazon basin that was very little known. Late last year he addressed the Berlin Geographical Society on his journey, and the account of his itineraries and his ethnological researches appears in the *Zeitschrift* of that Society (No. 2, 1906). The map which accompanies his paper is in part original material for the cartographers, as the explorer traced some of the unknown head waters of the Rio Negro. He made his headquarters at São Felippe, far up the Rio Negro, and found this town to be a well-ordered settlement in which a good measure of civilization has been introduced by a Spaniard who had settled there. In his journeys on the Içana, Uaupés, Aiary, Curicuriary, and other streams that swell the volume of the upper Rio Negro he observed, as a characteristic of the region, that the water systems approach quite near to one another. The Aiary, for example, in its upper course, approaches so close to the Uaupés as to permit the journey from one stream to the other to be made in three and a half hours across a low water parting. The Tiquié, a western tributary of the Uaupés, is separated from the system of the Yapurá by a low water-parting that was crossed in fifty minutes.

Dr. Koch-Grünberg made four journeys along these waterways, some of which rise in Colombia and others in Venezuela. On his second journey he descended the Rio Negro to the mouth of the Curicuriary, where he climbed a mountain of the same name which the natives associate with many legends. The path up the

mountain led through splendid virgin woods, and the ascent was difficult; but he was amply compensated by the view over the boundless forests. Comparatively few Indians live in this region, and they are emigrants from the Uaupés, chiefly Tukanos, who have here found a refuge from the advance of so-called civilization. He also found wandering Indians, the Maku, who live on a much lower plane of culture. Most of the rivers are broken by waterfalls. He collected much ethnological material among the various tribes, some of whom had never seen a white man. He says that black-and-white water streams alternate without apparent reason, the two kinds occurring sometimes only a few hundred yards apart, though flowing through the same forest and over the same soil. The natives regard the white water streams as conducive to fever, while they assert that the black water streams have no evil influence. The third journey, up the Uaupés, involved great labour, on account of many waterfalls; but above the junction with the Jurupary the river presents a wholly different character, and flows sluggishly through swamp lands entirely uninhabited.

The Fossils from Patagonia.—Dr. William B. Scott, Professor of Geology at Princeton University, read a paper before the Wyoming (Pa.) Historical and Geological Society in which he described the remarkable discoveries of fossils in Patagonia. The paper is in the *Proceedings* for 1905. Some of the fossil bones taken to England by Captain Sullivan and Mr. Darwin were thought to be identical with certain European fossil remains, and it was one of the puzzles of geographical distribution how the same animals should be found in Europe and in the southern extremity of South America and yet be absent from North America. The hypotheses invented to account for this supposed paradox have been rendered superfluous by proof that the identification of the European genera was a mistake. The work of the Ameghino brothers revealed such an astonishing number of extraordinary animals that are found fossil in the rocks of Patagonia as to attract the attention of geologists and paleontologists. Dr. Scott then told of the three expeditions, 1896-99, led by Mr. J. B. Hatcher while connected with Princeton University, to acquire the necessary materials in Patagonia for a comparison between the strange fossils of that country and those of the northern hemisphere. His success was most gratifying, and his collections of fossils are of extraordinary richness and variety.

These fossils have been fully described and illustrated by Dr. A. E. Ortmann in Vol. 4 of the "Reports of the Princeton University Expeditions to Patagonia." Dr. Ortmann showed that the South American geologists had placed the Patagonian beds too low in the geological scale, and demonstrated that they are referable to the lower Miocene, and he further pointed out the close similarity between the fossils of the Patagonian beds and those of corresponding age in Australia and New Zealand. As the animals are of shore-water types which could not have crossed great depths or widths of sea this similarity is strong evidence for the former existence of a land connection between South America, Australia, and New Zealand, very likely by way of the Antarctic Continent. In connection with this statement by Dr. Scott it is interesting to mention the Tertiary fossils discovered in Graham Land by Dr. Nordenskjöld, which are identical with flora of the same geological age found in the southern part of South America.

The fossils of greatest interest secured were birds and mammals of the Santa Cruz beds which overlie the Patagonian beds, are several hundred feet in thickness, and cover a very large area of Patagonia from the mountains to the sea,

also extending eastward for an unknown distance under the waters of the Atlantic. A large part of the Santa Cruz collection was obtained where the water is from 20 to 30 feet deep at high tide. The tide here has a greater rise and fall than on any other open coast.

The Santa Cruz beds are chiefly volcanic materials apparently laid upon a land surface, their stratification being largely due to the sorting action of the wind. They contain an extraordinary abundance of fossil bones which, as yet, have been found only in the more or less consolidated volcanic tuffs, which are very soft and easily eroded. This explains the occurrence of such a very unusual number of nearly or quite complete skeletons, even of the smallest or most fragile animals, that have been buried where they lay on the surface of the ground.

Dr. Scott thinks it is probable that many of the animals were caught alive, suffocated and buried in the showers of volcanic ashes and dust. To the observer who examines these fossils for the first time it is like getting into a new world where all the animals are different from the familiar types. Birds are surprisingly common in view of the usual scarcity of fossil birds. Most of the Santa Cruz birds were evidently incapable of flight, and some of them are of exceedingly large size. The most abundant and best-known genera, though flightless, are most nearly related to the South American cranes and not at all to the ostrich type. The mammals are far more important and abundant than the birds. Dr. Scott devoted most of his paper to descriptions of the rich and diversified life of Patagonia in Santa Cruz times.

ASIA.

A Notable Journey in Central Asia.—Count de Lesdain made a long journey through inner China and Tibet in 1904. He wrote from Darjeeling a brief letter to the Paris Geographical Society, on Nov. 25th last year, saying that he started on June 20th, 1904, from Peking, and first visited the still unknown desert region of Ordos, which is included between the Great Wall of China and the northern bend of the Hoang-Ho. Then he entered the region of Ala-Shan, to the west of Ordos, traversing it in various directions and discovering a large number of ruins. After making a journey to Kumbum, the explorer discovered several lakes in the still unknown part of the Central Gobi and then made preparation to cross Tibet. He first travelled through the salt waste of Tsaidam, and then made a very toilsome journey to the headwaters of the Yangtse-kiang, whence he travelled south, crossed the Brahmaputra, and finally reached Gyangtse, through which the British passed on their expedition to Lhasa. Further information from the Count is awaited with interest, as it is believed that he has procured material of much value for our knowledge of inner Asia.—(*La Géog.*, 1906, p. 170.)

Japanese Meteorological Service in Korea and Manchuria.—Professor Y. Wada, who at the beginning of the Russo-Japanese war was entrusted by the Japanese Government with the organization of a meteorological service in Korea and Manchuria, has prepared an account of this service, which appears in a recent number of the *Monthly Weather Review* (No. 9, 1905). The number of stations is now twelve, including Chemulpo, Mukden, and Port Arthur. There are, in addition, four others which are at the same time marine semaphore stations. The Chemulpo Observatory is of the first order. All the stations make six observations daily, at 2, 6, 10 A.M. and P.M., 135th meridian time (east of Greenwich). Each station is provided with a Fortin barometer, an August psychrometer, maxi-

mum and minimum thermometers, Robinson anemometer with electrical attachment, wind vane, rain gauge, atmometer, Jordan sunshine recorder, and Richard thermograph, barograph, and hygrograph. At the Chemulpo station there is also an anemograph, an anemo-cinemograph, a pluviograph, a micro-seismograph, earth thermometers, etc. Daily telegraphic reports are received from the principal stations in Japan and from those in Korea and Manchuria. Further, two daily telegrams are received from some Chinese stations and from Manila. These reports suffice to enable the Chemulpo Observatory to make weather predictions and to issue storm warnings. All meteorological stations on the Korean and Manchurian coasts issue weather predictions at 4 P.M. daily. The central observatory issues storm warnings when a cyclone is expected on or near the coasts of Korea and Manchuria. Storm signals are then displayed at all the stations.

R. DEC. W.

EARTHQUAKES IN FORMOSA.—Fully adequate reports have not yet been made on the very severe earthquakes in south Formosa which occurred on March 17 and April 14. In both shocks Kagi suffered more damage than any other town. The shock of March 17 killed 1,228 persons, and injured 2,329, while 5,556 houses were totally and 3,383 partially destroyed. The disturbance of April 14 was really more severe than the earlier one, but the death-roll was small, because the people were on the alert after their earlier experiences, and a comparatively small amount of damage was done, because there was not much left to destroy. In the second shock 7 persons were killed and 35 injured at Daigo, where 400 buildings were destroyed; while in the Ajensui district the casualties amounted to 3 killed and 15 injured, 1,191 houses collapsing and 749 being partially wrecked.

EUROPE.

POPULATION OF GERMANY.—The population of Germany, according to the enumeration of December 1, 1905, is 60,605,183. The States having the largest population are Prussia, 37,278,820; Bavaria, 6,512,824; Saxony, 4,502,350; Württemberg, 2,300,330; Baden, 2,009,320; Hesse, 1,210,104; and Mecklenburg-Schwerin, 624,881. Alsace-Lorraine has a population of 1,814,626. The most populous provinces in Prussia are Silesia, 4,935,823; Brandenburg, 3,529,839; Saxony, 2,978,679; Pomerania, 1,684,125; and Posen, 1,986,267. Berlin has 2,040,222 inhabitants.—(*Geog. Zeitsch.*, No. 4, 1906, p. 226.)

CHAIR OF GEOGRAPHY IN THE UNIVERSITY OF EDINBURGH.—The Senatus of the University of Edinburgh has approved of geography as a subject qualifying for graduation in the Faculties of Science and Arts, and the University authorities have given their approval to the proposal for the establishment of a Chair of Geography. The Councils of the Scottish Geographical Society, the Royal Society, and the Edinburgh Merchant Company have expressed themselves as favourable to this object, and a Committee representative of these and other bodies has been formed to raise the necessary funds for the endowment of the Chair. An appeal has been issued to the people of Scotland for their assistance in raising funds for this endowment. About $8,000 have thus far been subscribed. The minimum amount requisite to endow the Chair is $75,000, but if this sum is not immediately forthcoming, a lectureship may be established as a preliminary. In its appeal the Committee says:

> The claims of the science of geography, as a university subject, have long been recognized by the leading German and French universities, and in recent years the universities of Oxford and Cambridge

have also established schools of geography. but as yet there is no special teaching of geography in any Scottish university. The efficient teaching of geography in our schools and colleges is one of the most urgent needs of our time, affecting the political and commercial welfare of the Empire, and it is believed that the subject cannot be satisfactorily dealt with until our universities take it up and provide, in the first place, adequate training for teachers.

THE HISTORY OF THE GEOGRAPHY OF SCOTLAND.—A recent address by Sir Archibald Geikie before the Scottish Geographical Society, published in the March number of the *Magazine,* outlines in an interesting style the main events in the geological history upon which the present scenery of Scotland depends. It is a scientific paper by the master who is best able to treat the subject, and a striking illustration of the relation of geographical features to geological changes, even to those of the most remote past.

A part of northwestern Scotland has the oldest-known landscape in Europe—a land surface so ancient "as to date back to a time before the earliest-recorded traces of living things had appeared upon the surface of the earth." This land surface was buried beneath a great thickness of strata, by the partial removal of which the fossil landscape has been brought to view, and after millions of years of preservation again become a land surface. After the burial of this ancient land beneath sedimentary deposits there came a period of great mountain growth, upheaving a lofty mountain range wider than the mainland of Scotland, and stretching for 1,600 miles from the west of Ireland, through Scotland and Scandinavia to the Arctic. In the course of this the rocks were not only folded, crumpled, and greatly altered, but broken along nearly horizontal planes or overthrust faults, and pushed bodily westward, bringing younger rocks above older ones. Some of these blocks "were thrust forward for a distance of ten miles or more."

Since this period of mountain-folding the rocks have been subjected to denudation and the mountains "cut down to their very roots." Again and again large areas have been down to sea-level, and even placed below the sea, receiving deposits of younger strata, remnants of some of which stand as outliers in favourable situation. Parts of the history are obscure, and some portions cannot be deciphered at all, for there are many gaps; but enough remains to permit the unravelling of the main threads of the history by which the landscape of to-day has been evolved. Not the least interesting of the events is the appearance of volcanic activity in the region, not once merely, but in several successive periods, the last and greatest being in Tertiary time.

Each of the events has stamped its mark on the present topography. The difference between Highlands and Lowlands; the peaks and valleys; the crags and terraced volcanic tablelands; the lochs and firths: in short, both the general and the detailed features of this interesting land can be understood only in the light of geology. Even the modern economic development of Scotland is dependent upon geological changes of the past. For example, the deposit of coal, which is of such vital importance to Scotland, was made possible by geological changes; but even more than that, had it not been

for the effect of subsequent dislocation of the crust, whereby the coal-fields were let down many hundreds of feet, and were then protected from denudation, these important elements (coal and iron) in our national resources might have been largely or wholly removed, as has happened in Ireland, where no such fortunate series of dislocations occurred to retard or prevent the destruction.

This history, well illustrated by maps and half-tones, is told in a most fascinating way, and well warrants Geikie's statement that

it impresses upon us how vague and incomplete our conceptions of landscape must be, unless we acquire

some knowledge of the origin and relations of the different topographical features which give to landscape its distinctive characters, its variety, and its charm.

It is encouraging to find such papers in geographical magazines, as witness that modern scientific geography is winning for itself a place in English-speaking countries. R. S. T.

ENCOURAGING FOREIGNERS TO VISIT SPAIN.—The Spanish Government has appointed a National Committee to have charge of the work of encouraging foreigners to visit that country. The Commission is preparing to distribute in foreign lands itineraries, following which the chief national monuments and art works, the finest scenery, etc., may be visited most easily and comfortably. It is also consulting with the railway companies with a view to establishing special tariffs and fast, comfortable trains. It is further designed to bring about the improvement of service of all kinds relating to travellers in every town where tourists are likely to stop.—(*Daily Consular Reports.*)

STUDYING THE LAGOON OF VENICE.—A systematic study of the phenomena relating to the lagoon of Venice has been undertaken by the Venetian Institute of Science, Letters and Arts. The work now under way is in charge of a special Commission. The first investigations, relating chiefly to the tidal waves in the upper Adriatic, together with the rivers flowing into it and the lagoon of Venice, are in charge of Dr. Giovanni Piero Magrini.

IMPOVERISHING THE PYRENEES.—French newspapers and scientific journals recently reiterated the statements that the high pastures among the Pyrenees were being destroyed by the excessive number of sheep kept on them, and that the inhabitants were continuing to deforest the mountains and to burn the underbrush over large areas. The result is said to be that the pastoral industry has been declining; and the diminution of the forests has caused faster melting of the snows and an increase of the destruction wrought by torrents in the lower valleys and among the foothills. The *Bulletin* of the Geographical Society of Languedoc (Quatrième Trimestre, 1905) says that the people of the lowlands complain that they are suffering from these practices of the mountaineers. The Bordeaux Association, whose special interest is the management of the mountain forests, undertook to restore the pasturage on 2,000 hectares in the valley of the Neste River. This work was very successful in the past year, and many mountaineers are profiting by the object-lesson given to them. Another mountain community has asked the Association's advice in efforts to improve the condition of its pastures; and still another, in the valley of the Adour, has stopped the practice of overgrazing. The mountaineers are becoming more and more inclined to substitute milch cows for sheep and goats. Count de Roquette strongly favours arboriculture as a means of improving the condition of the mountain-dwellers, and various means of reforestation by private enterprise and under Government control were considered at a recent meeting of the Bordeaux Association.

RUSSIAN POLITICS AND CLIMATE.—In an address on *The Geographical Foundations of Russian Politics,* by Dr. Charles Sarolea, delivered before the Royal Scottish Geographical Society, at Edinburgh, February 18 last, reference was made to certain climatic features which have been important controls in Russian national life. The unity of the infinite plain is rendered more striking because of the unity of the climate. In summer there is a unity of continental summer

heat. In winter there is a unity of snow, which buries the whole country from Poland to Siberia. The traveller can then go on his sledge for a distance of 6,000 miles from the Baltic to the Pacific; from Archangel to Astrakhan. In the extreme north are the frozen tundras, inhabited only by the Laplander and the reindeer. In the extreme south are the deserts of salt, crossed only by nomadic tribes and camels. In between European Russia is divided into three zones: the region of primeval forests in the north; the region of grassy steppes in the south: the intermediate region of arable land, the famous "black soil," fertile to a degree, yielding abundant harvests. The forest-dwellers have need of the agricultural products of the black soil, the granary of Russia. The farmers need the fuel and building material and moisture of the forest. The grassy steppe is the hinterland of the black soil. The arable land yearly encroaches on the steppe. Throughout these three zones Russia is an agricultural community.

The irresistible impulse towards summer climes has been natural and intense in the Russian people, "because no other nation has been so distinguished by nature, no nation has been so entirely bereft of heat and light." The Crimea and Transcaucasia, the southern provinces, have always been to Russia what Switzerland and the Riviera, Italy and Greece, are to an Englishman or a Teuton. This "heliotropic" instinct is like that which turns a flower toward light and heat.—(*Scottish Geogr. Mag.*, April, 1906.) R. DEC. W.

POLAR.

CAPTAIN MIKKELSEN'S EXPEDITION.—The Anglo-American Arctic Expedition, in command of Captain Ejnar Mikkelsen, has started for its field work. Captain Mikkelsen sailed from Victoria, B. C., on May 20 on board the schooner *Duchess of Bedford,* formerly a sealer, which he had purchased. The vessel is built of camphor wood without outside planking of kayacki wood, and is sheathed, above and below the water-line, with gum-wood, the bow being further protected with iron plates and two bulkheads and beams in the hold to withstand ice pressure. The schooner's length is 67½ feet, with 8-feet draught, and, with the additional strengthening which Captain Mikkelsen gave her, she is well adapted for Arctic work.

The scientific work which the expedition has in view includes tidal observations along Alaska and Banks Land, geological, ethnographical, and zoological collections among the western Parry Islands, meteorological observations during two years, a line of soundings northwest from Prince Patrick Island, and a sledge trip on the Arctic Ocean west from Banks Land for the purpose of locating the edge of the continental shelf and discovering new islands, if there is a western extension of the Parry archipelago.

Capt. Mikkelsen took with him in his ship the following persons: Mr. Leffingwell, geologist; Mr. E. Ditlevsen, naturalist and artist; Dr. George P. Howe, surgeon; and in the crew J. Edwards, mate; Mr. Parker, second mate; E. Gilmour, cook; Chr. Thursen and T. Storken, sailors.

Mr. V. Stefansson, ethnologist, started north from Athabasca Landing, May 12, to descend the Athabasca, Slave and Mackenzie Rivers to the Arctic Ocean, where he will meet the ship party. Mr. Stefansson expects to have an opportunity on the land journey to make desirable studies in his line of work. He will reach the Mackenzie delta about six weeks before the arrival of the vessel, and

will improve this time to make collections and studies for comparison with results to be obtained later among the Parry Islands.

Captain Mikkelsen on his journey north will make a short stop at Kadiak Island and then cruise along the coast of eastern Siberia, where he expects to purchase fifty or sixty dogs and one or two ponies. He hopes to enter Bering Strait about Aug. 1st, and push along the Alaskan coast in the shallow coast waters, thus avoiding the heavy pack-ice. Passing Point Barrow he will give what time may be spared to tidal observations, especially between Harrison Bay and Herschel Island, where there seems to be a sudden change of twelve hours in the tide constant. He hopes to reach the mouth of the Mackenzie about Aug. 20.

The united party of ten men will then sail eastward past Cape Bathurst, cross over to Prince of Wales Strait, and make a supply dépôt near Princess Royal Island. Retracing its course, it will establish winter quarters in Minto Inlet on the west coast of Prince Albert Land. Hunters will be sent out to secure fresh meat for the party and food for the dogs. As much scientific work as possible will be in progress during the winter.

In the spring of 1907 a party of two men, replenishing its supplies from the dépôt near Princess Royal Island, wil endeavour to cross over to Melville Island and thence to Prince Patrick Island. If this party succeeds it will be the first to pass through the interior of Prince Albert Land, Banks Land, and Melville and Prince Patrick Islands, four of the larger islands in the archipelago. The party will also try to survey the unexplored northwest coast of Prince Patrick Island, and hopes to make a sledge journey on the sea about 75 miles to the northwest, making soundings through the tidal cracks, and thus obtaining an idea of the configuration of the sea-bottom. It is hoped that this party will be back at head-quarters early in June, where the other scientific workers will have been engaged in extending their knowledge by trips from the vessel.

As soon as the ice has sufficiently opened, the vessel will cross over to Nelson Head at the south end of Banks Land, and thence sail up the west coast through the channel between the pack-ice and the shore to Burnet Bay, where she will unship the provisions and remain either until the autumn of 1907 or, if supplies permit, until the summer of 1908, being then sent home.

In the spring of 1908 a party of three men, the dogs, and the pony, with provisions for 140 days, will start over the sea-ice in a W. N. W. direction, making soundings as frequently as possible and keeping on the same course until the edge of the continental shelf is passed, land is found, or the position of 150° W. Long. and 76° 30′ N. Lat. is reached. If the edge of the continental shelf is reached, the party will endeavour to trace it to the westward. If land is found, it will be explored as far as the supplies permit. Provisions will be economized by killing draft animals when their services may be dispensed with; the weight drawn by each animal will be kept as even as possible. When it is necessary to return to the coast the party will retreat to Wrangel Island or to the nearest Alaskan coast, as circumstances may decide. The observers left at Burnet Bay will be taken home on the ship, but the sledge party will have to rely on the whalers along the Alaskan coast for passage home, unless they should arrive at Wrangel Island in time to meet their own vessel, which will call there on the way south.

Mr. Stefansson especially hopes that the field may be fruitful in ethnological collections, half of which have been pledged to Harvard and a quarter to Toronto

University for assistance rendered by these institutions to the expedition. He will study the old Eskimo remains in the western part of the Parry archipelago and the natives of to-day, if any are living there. He is a graduate student and an assistant Instructor in Anthropology in Harvard, and has twice held the Hemenway Fellowship in Anthropology. He spent the summer of 1904 and 1905 in Iceland, and brought home a large number of skulls and skeletons of the inhabitants of heathen times. These are now in the Peabody Museum.

Captain Mikkelsen's scheme of exploration covers a great deal of ground; but even if the conditions permit him to carry out only a part of his programme, the results will place his among the notable Arctic enterprises.

Meteorological Stations in the Antarctic.—The Argentine Government intends to maintain the scientific observation station started by the Scottish Antarctic Expedition on the South Orkneys, a little north of the Antarctic area, for at least another year, which will complete a series of observations extending over four years. At the end of December last the Argentine steamer *El Austral* left Buenos Aires with three scientific observers under the lead of Señor Lind to relieve the observers at Scotia Bay, South Orkneys. From that point the vessel was to go to Ushuaia, in Tierra del Fuego, where Mr. Angus Rankin, formerly in charge of the Ben Nevis Observatory, with three companions, had gone to await the steamer. With these observers on board, *El Austral* was to steam south to Wandel Island, in the Graham archipelago, where Rankin will establish a new meteorological and magnetic station in the Antarctic for the Argentine Government. Upon the return of the vessel to Buenos Aires, Mr. Mac Dougall, a former member of the Ben Nevis force, will be sent to South Georgia, where a second Antarctic station will be found. Thanks to the liberality of the Argentine Government, the meteorological and magnetic conditions of this part of the Antarctic will be fully investigated.—(*Geog. Zeitsch.*, No. 4, 1906.)

VARIOUS.

Great Canals of the World.—The U. S. Department of Commerce and Labor has issued a monograph on "Great Canals of the World" prepared in the Bureau of Statistics. It brings together a large amount of information on the great canals, with special reference to the Suez, Cronstadt and St. Petersburg, Corinth, Manchester, Kaiser Wilhelm, Elbe and Trave, Welland, Sault Sainte-Marie and Canadian canals. The interior canal systems of various countries are also adequately treated, and with much information as to their history, cost, freight rates, and the commerce that passes through them. This is a valuable compilation, relating to one of the greatest factors in international transportation.

Forests and Rivers.—At the meeting of the International Navigation Congress, held at Milan recently, the question of the influence of deforestation upon the régime and discharge of rivers was again discussed. There was no difference of opinion concerning the fact that improvident deforestation has markedly changed the water supply of neighbouring rivers; that brooks have disappeared; many rivers are less useful as sources of power; and that large rivers are more liable to flooding on the one hand and periods of low water on the other. Many striking examples were cited of the deleterious results of cutting down forests, especially in hilly districts. Thus, in the commune of La Bruguière, forests on

the slopes of the Montagne Noire (Tarn) were cut down. In consequence, a brook at the foot, whose water had been used for driving some mill-wheels, dried up in summer to such an extent that it was of no use as water power, while in winter floods caused great damage. After reforestation, the brook became more regular, and was once more available for power. The floods of winter also ceased. In Switzerland, in the canton of Berne, a spring which had ceased to flow started up again after reforestation of a mountain-side. Later, when the trees were again cut down, the spring almost disappeared. In the Kazan district of Russia, where formerly seventy water-mills were at work, and where most of the forests have been cut down, less than half of these mills are now running, and most of these on half-time only, being idle in summer for want of water. In winter the rivers are impetuous torrents, breaking up mill-dams and doing other damage. In Sicily, in the province of Messina, the river-beds have been raised by the stones and earth carried down by the torrents since deforestation, and great damage has been done by floods.—(*Nature,* Vol. 73, 1906, 319-320.) R. DEC. W.

VARIATIONS OF GLACIERS.—The tenth Report of the *Commission Internationale des Glaciers* shows that glaciers are still diminishing in those places where they have been studied. Not one of ninety glaciers in the Swiss Alps shows an advance, thus confirming the general results of the past seven years. In the Savoy Alps and in the Pyrenees the shrinkage continues. With few exceptions the Norwegian glaciers have retreated. During the past year more than 110 glaciers in the Pamir have been visited by M. Fedtchenko, and all appear to be diminishing. Similarly there is retreat, with few exceptions, in the northwestern United States and western Canada. In Africa the amount of snow in the crater of Kibo has not increased since 1901, according to Uhlig. Thus the retreat of the glaciers which began about forty-five years ago still continues. The slight rally occasionally noted during the past decade has been overpowered. R. DEC. W.

GLACIAL EROSION.—In a splendidly illustrated article (*Journ. Geol.,* Vol. XIV, 1906, pp. 22-54) E. C. Andrews describes the evidence of profound glacial erosion in New Zealand. U-shaped main valleys, with flat bottoms, truncated spurs, steepened lower slopes, and hanging tributary valleys, are both described and shown in excellent half-tones. These features and the fiords he ascribes to ice-erosion, as others have done for similar phenomena in the Alps, Norway, Rocky Mountains, Sierra Nevada, and Alaska; and few if any physiographers will consider that he has failed to establish his thesis.

Besides this description and interpretation, Andrews advances and discusses the theory that during stages of maximum glaciation or "ice-floods" the glaciers so deepen and broaden their valleys as to produce "too great breadth and too slight a grade to admit of further corrasion by the present insignificant representatives of the former glaciers." In this connection he considers the difference in behaviour of a river in flood and in quiet stage as a basis for understanding the difference in behaviour of flowing ice-sheets in their flood and shrunken stages. This is an important consideration, and Andrews makes a strong case of it. It supplies food for thought for those geologists who, witnessing the feeble ice-erosion of weak glaciers, at their ends—the points of greatest weakness—argue from these observations that consequently great glaciers several thousand feet deep and moving rapidly are protecting rather than eroding their beds. It is

somewhat like arguing that since a small brook in its shrunken summer stage is not eroding its bed, therefore the Colorado River could not have formed its cañon. Profound glacial erosion is now established; it remains to discover the processes and the nature and causes for variation in the work of this important agent in land sculpture, upon which so much of our grandest scenery depends.

R. S. T.

Professor R. S. Tarr of Cornell University will conduct an expedition to Alaska during the coming summer, with four assistants and a number of packers. This expedition will study the Malaspina and Bering Glaciers and make a reconnoissance survey of the bed rock geology of the region between Yakutat and Controller Bays.

U. S. Board on Geographic Names.—Decisions May 2, 1906:

Black: mountain, Mohave county, Ariz. (Not Ute.)

Boot: island, south of Ile Richard, Mackinac county, Mich. (Not Bootjack.)

Carbon: peak, Elk mountains, Gunnison county, Colo. (Not Castle Peak, Mount Carbon, nor Mount Ohio.)

Coryell: island, east of Ile William, Mackinac county, Mich. (Not Ile Richard nor Coryell's.)

Cube: point, northwestern part of Marquette island, Mackinac county, Mich. (Not Cube's, Cubes, nor Kechetotawnon.)

Dead: mountains, San Bernardino county, Calif. (Not Black.)

Duck: bay, eastern shore of Marquette island, northwest of Wisner point, Mackinac county, Mich. (Not Wisner's nor Muscallonge.)

Elk Point: township and village, Union county, S. D. (Not Elkpoint.)

Fox: peak, on line between Granite and Ravalli counties, Mont.

Government: island, east of La Salle island, Mackinac county, Mich. (Not Ile William nor Ile Williams.)

Gravelly: island, east of Boot island, Mackinac county, Mich. (Not Ile Aux Cochons.)

Harney: peak, Black Hills, Pennington county, S. D. (Not Harney's.)

Island No. 8: north of Ile William, Mackinac county, Mich. (Not Ile Isidore.)

Mackinac: bay, east of Hessel, between south shore of Upper Peninsula and Marquette island, Mackinac county, Mich. (Not Duck nor Mackinaw.)

Marble: island, Sea Otter sound, southeastern Alaska. (Not Fox.)

Mohave: mountains, east of Colorado river, Mohave county, Ariz. (Not Chemehuevis nor Chimhuevis.)

Muscallonge: bay, between Conners point and Wisners point, Mackinac county, Mich. (Not Big Muscallonge.)

Orca: bay, Prince William sound, Alaska. (Not Cordova.)

Palisades Park: borough, Bergen county, N. J. (Not Palisade Park).

Poquoson: river, emptying into Chesapeake bay, Va. (Not Pocoson, Pocosin, nor Poquosin.)

Racetrack: peak, at the head of Boulder creek, latitude 46° 21′, longitude 113° 02′, Granite county, Mont. (Not Mount Powell.)

Sauk: point, near Baraboo, Sauk county, Wis. (Not point Sauk nor Sauk Summit.)

Tsadaka: creek, tributary to Matanuska river, 20 miles above Knik arm of Cook inlet, Alaska. (Not Moose.)

TUNP: mountain range above Rock creek, west of Hams Fork plateau, east of Sublets range, Uinta county, Wyo. (Not Campbell, Seedskeedee, nor Tetlick.)

WHITEFISH: point, west of Prentiss bay, Mackinac county, Mich. (Not Whist island nor Whitefish island.)

ARIZONA.

GRAND CANYON OF THE COLORADO, COCONINO COUNTY.

Ariel: point.
Boucher: trail.
Boulder: creek.
Brahma Temple: peak.
Bright Angel: canyon.
Bright Angel: creek, flowing into Colorado river.
Bright Angel: point.
Buddha Temple: peak.
Cameron: trail.
Cedar: spring.
Cheops Pyramid: butte.
Clear: creek, branch of Colorado river.
Coconino: plateau. (Not Colorado.)
Cocopa: point.
Confucius Temple: butte (one of Twin Buttes.)
Cope: butte.
Cremation: creek.
Crystal: creek, flowing into Colorado river. (Not West Fork.)
Dana: butte.
Deva Temple: peak.
Dragon: creek, flowing into Crystal creek. (Not East Fork.)
Dragon Head: butte.
Dripping: spring.
Garden: creek, flowing into Colorado river.
Grama: point.
Grand Canyon: canyon of the Colorado river.
Granite: gorge.
Grapevine: creek.
Greenland: spring.
Haunted: canyon.
Hermit: basin.
Hermit: creek.
Hindu Amphitheatre: basin. (Not Hindoo.)
Hopi: point. (Not Rowes.)
Horn: creek.
Horus Temple: peak.
Isis Temple: peak.
Komo: point.
Little Dragon: plateau.
Lyell: butte.
Manu Temple: butte.
Maricopa: point. (Not Sentinel.)
Marsh: butte.
Mencius Temple: butte (one of Twin Buttes).
Mohave: point.
Monument: creek.
Natchi: point.
Newton: butte.
Obi: point.
O'Neill: butte.
Osiris Temple: peak.
Outlet: canyon.
Outlet: spring.
Oza: butte.
Phantom: creek, flowing into Bright Angel creek. (Not West Fork.)
Pima: point.
Point Sublime.
Ribbon: falls.
Roaring: springs.
Salt: creek.
Shiva Temple: peak.
Shoshone: point. (Not Cremation.)
The Colonnade: high terrace.
The Dragon: plateau.
The Transept: deep canyon.
Tiyo: point.
Tonto: trail.
Tower of Ra: butte.
Tower of Set: butte.
Trinity: creek, flowing into Colorado river.
Tuna: creek.
Walhalla: plateau. (Not Greenland.)
Walla: valley.
Yaki: point.
Yavapai: point.
Yuma: point.
Zoroaster Temple: peak.
Ottoman Amphitheatre: basin.

NEW MAPS.

AFRICA.

GAMBIA.—Gambia. Scale, 1:1,000,000, or 15.7 statute miles to an inch. Compiled in the Topographical Section, General Staff. London, 1905. (Price, 1s.)

The positions of villages, rivers, and hills are only approximate, as no part of this region has been surveyed. The place-names in the neighourhood of the Gambia River are very numerous.

AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

UNITED STATES.—Kentucky. Sketch Map of Log Mountain Mining District. Scale, 1:45,000, or 0.71 statute mile to an inch. U. S. Geol. Sur., Prof. Paper No. 49. Washington, 1906.

Shows the principal coal-beds, the location of the mines, prospects and outcrops, and, by red lines, the structure of that part of the basin.

UNITED STATES.—Kentucky. Geologic Map of a Part of the Cumberland Gap Coal Field. Two Sheets. Scale, 1:45,000, or 1:071 statute mile to an inch. U. S. Geol. Sur. Prof. Paper No. 49, Washington, 1906.

Nine tints showing geological formations. The position of coal outcrops, mines, and prospects is indicated.

Geologic Atlas of the United States. Washington, D. C., 1905.

No. 135. Nepesta Folio, Colorado.

ALASKA.—Outline Map of Alaska showing Location of most important Roads as proposed by the Board of Road Commissioners for Alaska. Scale, 1:2,500,000, or 39.4 statute miles to an inch. War Department, Washington, D. C., 1905.

Shows in colours the constructed and proposed roads, trails, and telegraph lines. The map accompanies the first annual *Report* of the Board of Road Commissioners for Alaska, in which existing roads are described and plans for the improvement of roads and trails are given. Nearly all the proposed roads are to connect mining centres with navigation on the rivers.

BRASIL.—Vorläufige Skizze der Reisewege der Expedition Koch am oberen Rio Negro u. Yapura. Scale, 1:4,000,000, or 63.1 statute miles to an inch. *Zeitschrift* of the Berlin Geographical Society, No. 21, 1906.

Illustrates Dr. Theodor Koch's four journeys in 1903-05 on the upper affluents of the Rio Negro and along nearly the entire course of the Rio Yapurá. The map furnishes considerable material for laying down the courses of the tributaries of the Rio Negro. It shows the position of the few white settlements and the Indian villages, and marks many rapids and waterfalls in the rivers.

ASIA.

SIAM.—Carte du Siam. Scale, 1:6,000,000, or 94.6 statute miles to an inch. By E. Robert. *Bulletin* of the Royal Geographical Society of Antwerp, No. 3, Vol. 29, 1906.

A large part of this number of the *Bulletin* is devoted to a comprehensive

study of Japan. The map shows in red the boundaries of Siam, as fixed by the treaty of Feb. 15, 1904, with hydrography in blue and railways in operation or projected in black.

EUROPE-CENTRAL.—Neue Uebersichts-Karte von Mittel-Europa. Scale, 1:750,000, or 11.8 statute miles to an inch. Sheets G7, Banjaluka; H7, Orsova; G8, Cattaro; H8, Skuplje. K. u. K. Militär-Geographisches Institut, Vienna.

These are the first four sheets of the revised edition of one of the finest general maps of Central Europe before the public. The area of this very useful map is being extended in the new edition so as to include all that part of Europe lying between the Baltic and Constantinople and between the Rhone and the Crimea. When completed the map will consist of forty sheets. The sheets are being produced in two styles: One shows relief in brown shading combined with contours of 300 meters' interval, and is the style that will be preferred by experienced map-readers; the other generalizes relief by light-and-shade effects, elevation of contours being indicated on the margins, though contours are not marked on the sheets.

FRANCE.—Carte des Gisements de Coquilles Comestibles du Golfe du Calvados. Scale, 1:150,000, or 2.38 statute miles to an inch. By Joseph Guérin. *Bulletin* of the Monaco Oceanographical Museum, No. 67, Monaco, 1906.

Shows the distribution of oysters and other shell fish along this part of the French coast. Two insets show plans of the oyster beds at Courseulles in 1887 and 1905.

FRANCE-GERMANY.—Carte Générale des Vosges et des Regions voisines. Publiée sous le patronage du Syndicat d'Initiative des Vosges et de Nancy. Scale, 1:320,000, or 5.05 statute miles to an inch. By Commandant Frézard. J. B. Schmitt, Belfort, 1905. (Price 1fr. 50c.)

Lithographed in five colours: red for places, heights in figures, and routes; black for text and railroads, blue for water, green for boundaries, and brown wash drawing for topographic relief. The map is not drawn with superior refinement, but it clearly conveys an uncommonly large amount of information. Thus it has six distinctive marks for settlements and six for different kinds of land highways. It gives the French spellings of names, though many of them are not now the official spellings. On the margin the German spellings with French equivalents are given. The map will be especially useful to automobile and bicycle tourists.

GERMANY.—Versuch einer Karte der Alten Handelsstrassen in Deutschland. Scale, 1:1,500,000, or 23.7 statute miles to an inch. By F. Rauers. *Pet. Mitt.*, Vol. 52, No. 3. Justus Perthes, Gotha, 1906.

Illustrates a paper by Mr. Rauers on the history of the old trade-routes in Germany. It shows the network of roads along which freight was carried in the Middle Ages and later, and distinguishes between the main roads and their tributaries. Among the large number of towns about 300 are especially indicated as centres of the carting trade.

GREAT BRITAIN.—Environs of London. Scale, 1 statute mile to an inch. John Bartholomew & Co., London, 1906. (Price, 1s.)

This fine map, chiefly for tourists and cyclists, is an excellent guide to the suburbs of London. Railroads, main and cross roads, woods, country seats, towns, and even many houses are shown with great distinctness. While London is

coloured gray, the environing areas have a white base, on which is imposed, in several colours, the desired information. Surface forms are not indicated, the design of the map being to show merely the geographical relation of all towns and private estates to London and the best means of reaching them.

GREAT BRITAIN.—Maps Illustrating the Physical Evolution of Scotland. Scale, 90 statute miles to an inch. By Sir Archibald Geikie. *Scot. Geog. Mag.*, Edinburgh, March, 1906.

Eight maps on one plate illustrating Scotland as it was in the various geological epochs. Brown tints on each map show the land that is supposed to have existed at the periods mapped. The sea in each period is coloured blue, and the regions for which data are wanting are left uncoloured. Each map shows the present outlines of Scotland, and the series represents the physical evolution from the time of the Torridonian sandstone, still preserved in northeast Scotland as a part of the oldest-known landscape of Europe, through early Tertiary time.

SWITZERLAND.—H. Kümmerlys Touristenkarte von Graubünden. Scale, 1:300,000, or 4.7 statute miles to an inch. Geographischer Kartenverlag, Bern, 1905. (Price, paper 2.50f., linen 3.50f.)

Based on the topographic survey of Switzerland, with the features of the relief effectively accentuated by light and shade. Leading towns are in bold type, railroads in red, and the names of the principal glaciers and many heights are given. Valleys are differentiated from other topography by a green tint. Though most of the area covered is in German Switzerland, a considerable number of spellings of place-names do not follow the usual German orthography. The map will be extremely useful to tourists in that region.

SWITZERLAND.—Karte von Bodensee und Rhein, mit den angrenzenden Gebieten von Baden, Württemberg, Bayern, Österreich und der Schweiz. By Professor F. Becker. Scale, 1:125,000, or 1.9 statute mile to an inch. Verein für Geschichte des Bodensee's und seiner Umgebung und dem Bodensee-Verkehrsverein. Bern, 1905. (Price, 2 M.)

A very fine specimen of map-making. Contours show the level of the floor of Lake Constance.

OCEAN ROUTES.

A. BARENTS AND KARA SEAS.—Die Fahrt nach dem Ob und dem Jenissei im Jahre 1905. No scale. Annalen der Hydrographie, No. 5, 1906, Berlin.

B. SIBERIA. Der Jenissei von der Mündung bis zum Kap Gostinny. Scale, 11 kilometers to an inch. Annalen der Hydrographie, No. 5, 1906.

C. SIBERIA.—Lukowaja Protoka. Scale, 500 meters to an inch. Annalen der Hydrographie, No. 5, 1906.

The above three maps illustrate an account by Mr. J. Hermann of the remarkable journey of more than twenty vessels in 1905 in the service of the Russian Government through the southern part of Barents Sea and Kara Sea to the Ob and Yenesei Rivers. A shows the courses followed by the vessels of the expedition from Värdo and Catherine Harbor to the Siberian Rivers; B is a survey of the lower Yenesei based upon the Russian Admiralty chart, as revised by Captain Berg of the steamer *Sweaborg*. C is a survey with numerous soundings of Lukowaja Strait.

WORLD.—Transportation Routes of the World. (Mercator Projection.) Department of Commerce and Labor, Bureau of Statistics, Washington, 1905.

Illustrates a monograph on the "Transportation Routes and Systems of the World." The pamphlet says that the map is intended to present "a bird's-eye view of the great land and water transportation routes." The great river routes which extend navigation from the sea far inland are not shown. River routes, of course, cannot be completely ignored in a map adapted to show the great highways of commerce.

ATLASES.

ANDREES ALLGEMEINER HANDATLAS.—In 139 Haupt und 161 Nebenkarten; nebst vollständigem alphabetischem Namenverzeichniss von etwa 240,000 Namen. Fünfte, völlig neubearbeitete und vermehrte Auflage. (Lieferungen 19-30.) Herausgegeben von A. Scobel. Velhagen & Klasing, Leipzig, 1906. (Price of complete work, M. 28.)

A little more than half the sheets of the new addition have now been published. Sheet 53-54 (Provinz Sachsen und Herzogtum Anhalt) illustrates finely the clear and easily-read printing of a large number of place-names imposed upon mountain hachuring. No atlas has done more than Andree's to improve the legibility of atlas sheets that are thickly covered with detail. The Route Chart of the Atlantic Ocean (Sheet 23-24) shows the cable routes and steam routes and nationalities of the various steamship lines, together with some of their land connections. A number of the short African railroads extending into the interior are shown, but not one of the lines along the Gulf of Guinea, and the railroad from Buluwayo to Victoria Falls is not indicated, though the sheet bears the date of August last year, the very month that the British Association visited the Falls by rail. Among the especially attractive sheets is Nos. 5-6 (Nordpolargebiete), which, with its four inset maps, forms a splendid cartographic summary of our knowledge of the Arctic regions. American mapmakers who have recently represented certain unexplored Arctic coasts as though they had been surveyed would do well to observe the care with which this map distinguishes between known and unknown coastlines. The sheet showing southern Canada was issued just before the new Provinces of Alberta and Saskatchewan were formed out of a part of the North West Territories, and the new sheet, therefore, does not give the latest political sub-divisions. The large fraction of the new edition now published shows that it will enhance the great reputation already enjoyed by this Atlas.

ATLAS OF THE WORLD'S COMMERCE.—Compiled from the latest Official Returns at the Edinburgh Geographical Institute. Edited by J. G. Bartholomew. (Parts 2-4.) George Newnes, London, and Frederick Warne & Co., New York, 1906. (Price per Part, 25 cents.)

The two sheets contain six cotton and seven sugar maps. The larger map on the cotton sheet shows the areas of cultivation in the producing countries, distinguishes the areas that are being cultivated experimentally, and shows the direction taken by exports. The insets show the countries of importation and the centres of cotton manufacture; the distribution of the crop in the United States, coloured according to the number of bales per square mile; and distribution of the crop in China, Lower Egypt, and India, distinguishing between areas of large and small production. The reverse of the sheet is filled with statistical

diagrams and a general summary relating to cotton. The same kinds of information concerning sugar fill the second sheet. The description of the "Commodities of Commerce" is continued from *Bluestone* to *Chicory,* with 4 diagrams in the text. The opinion has already been expressed in the BULLETIN that this Atlas is to be highly recommended to advanced classes in commercial geography and to merchants as a superior reference volume.

The four double-page maps in Parts 3 and 4 treat the topics of Tea, Tobacco, Wine and Iron. The sheet given to each commodity shows the areas of production all over the world, the main lines of export transportation, and the importing countries, distinguishing between regions of large and small importation; also with larger-scale maps showing in more detail the regions of largest production. The back of each sheet is filled with statistical diagrams and descriptive letterpress giving the most important facts of production and consumption. The dictionary of the commodities of commerce is extended in these two parts from *Chillies* to *Gurjun Oil.*

ATLAS ZUR KIRCHENGESCHICHTE. 66 Karten auf 12 Blättern. Von Dr. Karl Heussi und Hermann Mulert. Verlag von J. C. B. Mohr (Paul Siebeck), Tübingen, 1905. (Price, 4 M.)

The practical purpose of this little atlas is to facilitate the study of Church history. There are not a few text-books on the history of the Christian Churches, but this is the first time that an atlas has been compiled as a cartographic aid in the pursuit of this study. It is to be welcomed, therefore, as a new and convenient source of information; and all the more because the maps have been very carefully prepared, though, of course, no map product can claim perfection.

A brief description of one plate will show the general plan of the work. On each plate are grouped a number of small maps relating to the general topic to which it is devoted. Plate IV, for example, deals with Church history in eastern Europe, and includes the following maps: (*a*) Missions among the Slavs, 867; (*b*) Position of the Church in east Europe about 1090; (*c*) Distribution of the Church in the Balkan Peninsula by the ordinance of Justinian; (*d*) The Church in the Lower Danube lands at the beginning of the 14th century; (*e*) Advance of the Latin Church in Russia and on the Black Sea in the 14th century; (*f*) Boundary between the Eastern and Western Churches before 1386; (*g*) The Eastern Churches about 1900.

It would seem desirable, at a later printing, to add to this useful work two or three sheets relating to modern missions.

HISTORICAL AND MODERN ATLAS OF THE BRITISH EMPIRE. By C. Grant Robertson and J. G. Bartholomew. 64 map plates and 19 insets, Gazetteer, Statistics, etc. Methuen & Co., London, 1905. (Price, 4s. 6d.)

Excellent maps, designed to enable teachers and pupils to examine separately or to compare with one another the historic, physical, economic, or political factors that have helped to make the British Empire what it is. The modern physical and economic maps are meant to serve for the geographical text-books, while the historical maps are intended to illustrate the whole course of British history from the point of view of Imperial development. The final plate is a diagram showing the chronology and expansion of the British Empire.

BOOK NOTICES.

Economic Geology of the United States. By Heinrich Ries, A. M., Ph. D., Assistant Professor of Economic Geology at Cornell University. xxii and 436 pp. The Macmillan Company, New York, 1905. (Price, $2.60.)

The non-metallic minerals are treated first in this work, both on account of their greater simplicity and the superior value of their output. It is difficult to compress so much material within one volume, but Dr. Ries has gained space by omitting matters of geological introduction, rightly assuming that these belong to earlier studies. The title is representative, as reference is made only to such foreign minerals as serve for chief sources of supply in this country. There are about 100 figures in the text, chiefly maps and sections, and 25 plates, mostly half-tones.

The treatment begins with coal. That so large a subject is put into 36 pages shows the rigid limits of space to which the author of a text-book is subject. The discussion is compact and comprehensive, even though short, and includes the following topics: definitions of kinds, analysis of thirty-one representative samples, origin and conditions of accumulation, structural features of coal-beds, descriptions of coal fields, production by years, States, and fields, as well as of leading countries, and bibliography. The last is a feature of all the chapters. In 1903 the United States produced 357,000,000 short tons, as against 257,000,000 for Great Britain and 178,000,000 for Germany. No other country produced 50,000,000 tons.

Building-stones are treated under the general heads of colour, texture, density, hardness, strength, porosity, and rate of absorption, resistance to frost and resistance to heat. The leading rocks are described under the head of granites, limestones and marbles, serpentine, sandstones and slates.

Under clays the author's reserve is well shown by the fact that but 17 pages are given to the subject, although Dr. Ries is the leading authority and most voluminous writer on clays in the United States. A sample of the compactness and fulness of the work may be found in the brief but informing definitions of numerous varieties of clay on page 99. Other sections are devoted to rock salt and various other salines, to gypsum, fertilizers, abrasives, and several minor minerals. The last include glass sand, graphite, and lithographic stone. Regarding this stone the opinion is expressed that native quarries, well developed and well managed, are capable of furnishing the limited supply needed in America, as apart from the product of the celebrated Solenhofen quarries of Germany. Zinc and aluminum plates have been substituted for some uses, thus reducing the demand for lithographic stone.

Chapters deal with mineral and underground waters, and, very properly, with soils, certainly the most important of all materials with which economic geology has to do.

Not quite half the volume is reserved for the metallic minerals. This part begins with a chapter on ore deposits, in which theories of origin and modes of occurrence are discussed in a way not unduly technical. Iron is given first place when the specific account of metallic minerals is undertaken. Favourable

location, high quality, considerable quantity, and structure permitting easy extraction are the four conditions assigned for the present predominance of Lake Superior ores.

The great preponderance of hematite among iron ores in this country is shown in the fact that for 1903 this type afforded 86.6 per cent. of the total production. The two leading producing regions at present are the Lake Superior district and the area about Birmingham, Alabama. The opinion of Van Hise is quoted, that the Lake Superior ores may be exhausted in the first half of the present century. The same authority looks forward to the marketing, in the near future, of ores running below 40 per cent. in iron. No other producing district in the world rivals the Superior region, which now affords at least three-fourths of the iron ore used in the United States. The current forming of limonite, or bog ore, is strikingly evidenced in the deposition, in Swedish ponds, of depths of 18 inches of this ore in periods varying from fifteen to thirty years.

It may surprise most readers to learn that the native copper of Michigan, as now mined, is contained in ores rarely running above 1 per cent. of native copper. Ninety per cent. of the copper of the United States comes from the States of Montana, Michigan, and Arizona, in the order named. Butte, in Montana, is the greatest producer in the world, the Anaconda mines alone yielding one-seventh of the world's supply. Butte began in 1887 to produce in excess of Lake Superior.

Fifty pages are devoted to gold and silver, including the silver-lead ores. Under aluminum, the bauxite localities are described, three in number: Georgia-Alabama, Arkansas, and New Mexico. The first was discovered in 1887, and the deposits have been worked since that time.

The book should be useful to a variety of readers, not only to students of economic geology, but to teachers of general geology and geography, and to all who are interested in the earth materials commonly used by man.

A. P. B.

The Geology of South Africa. By F. H. Hatch and G. S. Corstorphine. xiv and 348 pp. Macmillan & Co., London, 1905. (Price, $5.25.)

A related work, dealing with the geology of Cape Colony, was noticed by the present reviewer in the BULLETIN for December, 1905, page 753. The volume now noticed is of wider scope, but resembles the earlier work in being a summary account derived from many sources. Of the authors, Mr. Hatch has had wide connection with surveys in the British Empire, and Mr. Corstorphine was formerly Director of the Geological Survey of Cape Colony.

The beginnings of systematic South African geology are attributed to Andrew Geddes Bain, who died in 1864. The introductory chapter treats historically the growth of knowledge of that great region. The Transvaal began a survey in 1897 and Natal in 1898. The work suffered serious interruption in the years 1899-1903, the period of the war. The volume is adequately illustrated with sections, views, cuts of fossils, and maps. There is a folding map showing the geology of South Africa as a whole on the scale 78.88 miles=1 inch. There is also a large folding map of the formations of the Transvaal on the scale 19.7 miles=1 inch.

We find here what the work on Cape Colony lacks—namely, clear reference of the local formation names to the designations used in the world-wide

nomenclature of historical geology. Thus opposite page 33 is a folding tabular view giving the European equivalents, with successive parallel columns giving the formation names in Southern Cape Colony, Northern Cape Colony, Orange River Colony, Natal, Rhodesia, and the Transvaal. An extended bibliography is included, also an index of place-names and a general index.

The evidence of glaciation in Carboniferous times (*Devyka Conglomerate*) is given, but perhaps with less fulness than in the volume on Cape Colony. The same conclusions are ,however, fully accepted. The chapter on diamond-bearing deposits, following many sections of local geological descriptions, will, perhaps, have the most interest to the general reader. The diamonds are found in a serpentinous breccia, occurring in "pipes" which, with a more or less vertical altitude, penetrate the stratified rocks, whereas these gems are in many regions found in alluvial or washed beds.

The breccia is of volcanic origin, having been forced up through the sedimentary strata. The pipes contain many fragments of these inclosing bed-rocks which have been torn away in the violent ascent. The diamonds occur in many crystal combinations, and with a wide range of size. A remarkably large specimen, known as the Cullinan stone, found in January, 1905, near Pretoria, has a weight of 3,024¾ carats, equivalent to 1.37 lbs. avoirdupois. Some of the volcanic pipes, while resembling the rest in all other respects, yield no diamonds.

The first stone found was picked up on the bank of the Orange River in 1867 by a Dutch farmer. It was exhibited at the Paris Exposition, and ultimately purchased by the Governor of Cape Colony for the sum of $2,500. The surface area of the Kimberley mine comprises nearly 10½ acres, including 470 claims. In January, 1904, the main shaft had been sunk to a depth of 2,599 feet. Descriptions are given of the mines of Cape Colony, Orange River Colony, and the Transvaal.

As to the origin of the pipes, the authors favour the view that they are due to volcanic explosions, with abundant steam, accounting thus for the mud-like character of the mass. As to the origin of the gems themselves there seems to be much confusion of opinion. A. P. B.

First Report on the Relations between Climates and Crops. By Cleveland Abbe. U. S. Department of Agriculture, Weather Bureau. Bulletin No. 36. 8vo. Washington, D. C., 1905. Pp. 376. (Price, $1.50.)

There is always a very active interest on the part of the large portion of every community in the relations between climate and weather on the one hand and the yield and character of the crop on the other. This interest is not confined solely to farmers and meteorologists; it extends to that larger body of persons who are directly or indirectly affected by the harvest. Professor Cleveland Abbe, some years ago made a thorough and careful compilation and summary of the best published results on the whole subject of the relations of climate and crops up to the year 1891. This report, officially known as "No. 5119, Sig. 91," was ready for publication at that time, but for various reasons it could not then be printed. Having had the opportunity ourselves to look over Professor Abbe's paper some years ago, and having realized its importance from many points of view, we have been hoping for publication these past ten years. It is a pleasure to record the appearance of this report in print, as *Bulletin* No. 36 of the Weather Bureau. The words *First Report* at the beginning of the title are a pleasing indication that in time we may have a second report, bringing the subject up to date.

Professor Abbe's intention in the preparation of his summary was to notice only those investigations that have given precise information as to specific plants or crops and specific localities; he has made a thorough search of all the more important literature, in so far as accessible to him, and the result is a useful handbook of reference for agriculturists, teachers of botany and climatology, and investigators along various lines of agricultural and botanical research. The agricultural colleges and agricultural experiment stations were especially in the mind of the author in the preparation of this volume. At the present time, when our Department of Agriculture is devoting so much attention to the introduction of new plants which shall be better adapted to climatic conditions in different parts of our country than those previously cultivated, this book will be of special interest to the scientific farmers of the United States. Professor Abbe's immediate purpose is stated by him in his preface in the following words:

> As far as practicable, I have presented, in the words of the respective authors, the results of their own investigations on the points at issue, my own duty being not to undertake any extensive original study, but to merely connect their results together in a logical manner, to collect data for future general use, and to suggest or stimulate further inquiry on the points here presented.

The volume is very valuable in giving first-hand information, on the various aspects of the subjects with which it deals, in a compact form, easily accessible, well arranged, and fully indexed. The work is divided into four parts. Part I concerns *Laboratory Work, Physiological and Experimental.* Part II deals with *Open-Air-Work—Experience in Natural Climates.* In Part III, *Statistical Farm Work,* the crops and climates of the United States are considered. Part IV contains the bibliography and index. It is obvious that such a report as this will prove widely useful, and it is our hope that Professor Abbe will soon be able to prepare, and the Weather Bureau be able to publish, an extension of the work up to date.

R. DEC. W.

Der Rhein und sein Verkehr, mit besonderer Berücksichtigung der Abhängigkeit von den natürlichen Verhältnissen. Von Dr. Friedrich Wickert, in Wiesbaden, 148 pp., 2 maps, 29 diagrams. Stuttgart, J. Engelhorn, 1903.

Based upon very thorough search among German official and other literature on the great water-artery of central Europe, this book upon the Rhine and its relations to transit, trade, and industry is certainly a most deserving achievement. Necessarily, it is a compilation; but this conveys no reproach. Data, and data as copious and exact as those furnished by Dr. Wickert, can only be obtained from an abundance of documents. Fortunately, German literature on the subject is exceedingly full of information, and, still more fortunately, the author is most competent to make use of it. Clear and concise in his statements, moderate in his deductions and conclusions, he places before the student a wealth of material of the most positive sort, and never indulges in side-flings at extra-German countries and doings, such as often make German literature since the "great rise" of Germany in 1870-1871 so uselessly obnoxious. His language is plain and matter-of-fact, nothing more nor less.

His descriptions of the Rhine from the sources in southeastern Switzerland to the frontier of Holland could hardly be more exact. The allusions in it to the origins and movements of drift are well put and characteristic. With rivers of an alpine origin, two factors must be carefully considered. One, the amount and kind of drift they carry; the other, the periodical perturbances created by the

frozen sources of water-supply. This is very well accentuated in the description of the course of the Rhine as long as it remains under the direct influence of its alpine cradle. The rôle played by the Lake of Constance as a receptacle of drift carried by the river while yet in the state of a turbulent mountain stream, and of a clearing basin for the waters which emerge from it, leaving behind the detritus, is stated in few but expressive words.

Naturally, the main topics of the book—transit, trade, and industry, as affecting the Rhine and affected by it—become prominent only when the author has led his subject to where it becomes exclusively a German river. Previously only the northern bank of the Rhine, after leaving the Lake of Constance, is German, and through the affluence of Swiss branches of a partly alpine character and the geological features, to which Dr. Wickert is careful to refer, it is available only for rather primitive navigation, now largely superseded by railroads. The river becomes an important commercial highway only when it begins to flow between German banks. Dr. Wickert does not touch upon Holland. He might have done well, also, not to mention Swiss sections in a manner leading unsophisticated readers to suppose they might be parts of the German Empire of modern construction. The Canton of Graubünden, for instance, owes allegiance to Germany as little as any other part of Switzerland.

Very minute details, not only regarding the Rhine itself, but every one of its affluents on German soil, and taken from the most authoritative sources, constitute the bulk of Dr. Wickert's work. They are arranged geographically from south to north, and a wealth of tables, diagrams, and (at the end) highly-instructive maps, accompany them. The intention is to show the course of each tributary, the nature and resources of the countries traversed, the fluctuations of the water-courses produced by meteorological phenomena, and the influence they have had on transit, commerce, and industry, from former days (as far as data are accessible) to the present time. The author remains always true to his subject, not exceeding the limits that subject traces for him, but encompassing every thing that may be legitimately included. The historic side is treated in its proper place and in a concise manner. The flaws which have been pointed out do not affect the general excellence of the work. It is a book for study and reference, and a valuable contribution to hydrography and economic geography.

A. F. B.

Le Tour du Montblanc. Par Emile Daullia. viii–308 pp. Paris, Charles Mendel, 1899.

In this beautifully-illustrated volume the author is pursued too closely by recollections of *Tartarin sur les Alpes*. It is always difficult to imitate a genius like Alphonse Daudet, and when an attempt of the kind is to be harmonized with another "attempt" at serious description the outcome is usually a failure. Had Mr. Daullia confined himself to the rich material for description and information which his subject affords, and not tried to enliven his pages through too much "personal element," he would have produced a very readable book. As it is, there is not enough of the serious and there is too much of what *might* be entertaining, were it more vigorous. It appears that he sincerely enjoyed his "round-up" of the culminating point of Europe's highest mountains, that he felt the beauties of a scenery unparallelled, perhaps, anywhere; but the descriptions, however well written, are too much intersected by would-be humouristics of the mildest, most guileless, type.

The book is not altogether devoid of information, but it is, in the main, a kind of *feuilleton* rather than a piece of geographic literature. A great deal might have been said about the places described that would have been of lasting value. Dr. Daullia, however, sacrifices too much to the doubtfully witty. Whenever information is proffered it is not always correct. Thus the name of the celebrated St. Bernard dog, the mortal remains of which are preserved at the Museum of Berne, was not "Baril" but "Barry." Otherwise, the details given concerning these "Salvation" dogs are quite true.

No map accompanies this essay on the surroundings of Mont Blanc. The excellence of the photographic views compensates in part for the deficiency. The place of the book is with light literature of the semi-serious kind. A. F. B.

Die Eisenbahnen, ihre Entstehung und gegenwärtige Verbreitung. Von F. Hahn. 150 pp., Illustrations and Index. B. G. Teubner, Leipzig, 1905. (Price, M. 1.25.)

This interesting as well as edifying narrative treats of the origin, progress, and present distribution of railroads. It describes (1) pioneer railroad-building in England, Germany, and America; (2) railroad construction, rolling stock, signals, and other appliances so far as it is the purpose of the book to enter into the technical phases of the railroad business; (3) the great north and south roads, the great east and west roads, and the European mountain and city lines. The book is very readable, and at the same time full of information.

In the West Indies. By W. B. F. 64 pp. and 6 Illustrations from original photographs. Arnold Fairbairns, London, 1905. (Price, 1s.)

Contains ten articles, first printed in a British newspaper, and relating to Jamaica, Porto Rico, St. Thomas, the Boiling Lake of Dominica, cacao in Dominica, and Martinique. The book is well written, and gives a good idea of some of the islands from the tourist's standpoint. The author was very favourably impressed with the progress of Porto Rico (this is the official U. S. spelling, though the author uses the Spanish form). He says:

> It is not too much to say that, from a place of economic insignificance, the American will raise Puerto Rico to an island of the first importance in the West Indies, and this result may be looked for in a very little while.

Géographie agricole de la France et du Monde. Par J. Du Plessis de Grenédan. With 118 maps and diagrams. Paris, Masson et Cie., 1905. (Price, 7 fr.)

The object of this book is to place at the disposal of the students, in a clear and concise form, a sum of information on geographic-agricultural matters which could not be otherwise acquired except by laborious researches all over the field of general geography, and this purpose has been admirably attained. The author has selected, from physical, political, and economical geography, all that is of importance for the study of agriculture: the influences of soil, elevation, climate, geological structure of a given region on its production, the distribution of various forms of cultivation and production according to geographic conditions, and the ways and means by which, in each case, these conditions can be utilized to best advantage. The book is thus theoretical and practical at the same time, and the scientific spirit which pervades either part of the discussion makes it especially valuable among other books of this kind.

In the geographic conditionality of agriculture the author distinguishes between "natural" and "artificial" conditions. The former are the strictly geographic influences; the latter those created by the intervention of human activity—drainage, irrigation and other improvements, agricultural machines, population, transportation, opportunities for industrial utilization of agricultural products, and the like. These two chapters, preceded by a systematic introduction on the principal physiographic features of the country and supplemented by two short ones on the distribution of the different cultures and the national wealth represented in them, constitute the "general agricultural geography." They are followed by the "special agricultural geography," which deals with each culture in a separate chapter, discussing its conditions and possibilities.

This general and special treatment of France forms the first, and by far the largest, part of the book. The second part deals with the French colonies in accordance with the same scheme, and the third, likewise, with the agricultural countries of the world. The author sums up his results in a conclusion from a comparative point of view. According to him, the agricultural situation of the present is characterized by the contrast between the powers of large and small territories, whose conditions and prospects for the future differ materially from each other. Among the large territories Russia stands first in size. Even after deducting her share of forest, tundra, and desert, there are 600 million hectares of arable land in her possession, a large proportion of which is exceedingly fertile (the "black earth"). But there is no capital to develop these lands, and labour, though cheap, is handicapped by ignorance, laziness, and the comparatively thin population of this enormous area. These obstacles may be overcome in the course of time, but there will always be the two drawbacks of the uneven continental climate and the scarcity and remoteness of seaports.

Next in size follow the United States. They have less arable land than Russia, and no part of it can compare in quality with the black earth; but the climate is more favourable because less uniform: temperate in the East, continental in the centre, oceanic in the West, subtropical in the South. The population is numerous, and constantly increasing by a strong immigration. Capital abounds. Labour, while more expensive than in the Old World, is also better skilled, and avails itself of high-grade machinery, which counterbalances the difference in wages. An unparalleled location between the two largest oceans, a perfect organization of enterprise, and the general spirit of progress of the nation warrant the brightest prospects for the future.

China, the third in size, has 400 million hectares of fertile alluvial soil, among which is the unrivalled loess. The climate is varied, like that of the United States; labour is abundant, cheap, and intelligent. But the lack of machinery makes it comparatively more expensive, and the political and social conditions retard development.

Brazil comes next, with as much arable land as China and beautiful forests besides. A favourable climate and the excellent quality of the soil may one day enable her to compete with the United States, but the scarcity of population puts this day off to a rather distant future.

Australia's greatest disadvantage is her remoteness from the rest of the civilized world; wool and meat will always be the stand-bys of her farming industries.

East Africa repeats the Australian conditions on a smaller scale.

Argentina, while not quite so large, has comparatively better chances, her soil being very fertile and her climate favourable for white immigrants.

Canada, rich in fertile lands and forests, suffers from lack of hands to exploit her resources.

India has her most fertile regions in the very parts where the climate is unfit for whites, and indigenous labour is slow and unreliable. She may, however, increase her production beyond the present status.

In comparison with these large countries all others are only second-class Powers. The first group of them is formed by the countries of western and central Europe, whose place in the world-market is due mainly to the intensity of cultivation practised in countries of an old civilization. While at present France is behind Germany in the industrial race, the author is confident that as soon as she wakes up to a full consciousness of her natural resources, which are considerably superior to those of her rival, she will outstrip the latter just as the latter has outstripped Great Britain.

Another group comprises the extra-European countries of second-class size, such as Japan, Chile, Mexico, the Andean republics, Western Asia, Turkey, and also Greece. None of them seems so far to give promise of ever playing a rôle on the world-markets. All they can do is to satisfy the needs of home consumption.

To a third group belong the tropical countries of Africa. Their destination is to furnish colonies to the civilized nations as long as the regeneration of the black race, upon which an independent development of these countries will finally depend, is as yet a matter of a very distant future.

The book is very well written, and the illustrations and map sketches add greatly to its usefulness. M. K. G.

OBITUARY.

Israel Cook Russell.—Professor Russell, head of the Department of Geology in the University of Michigan, died on May 1. He was attacked by pneumonia, and his illness was brief. He was born in Garrattsville, N. Y., in 1852, studied at New York and Columbia Universities, was for a short time assistant Professor of Geology at Columbia, and became Geologist in the U. S. Geological Survey in 1880. He retained this position, though he subsequently became Professor of Geology in the University of Michigan. He wrote many scientific papers and a number of books, and was one of the most prominent and productive geologists and geographers of the country. He was vice-president of the American Association in 1904, and at the time of his death was President of the American Geological Association and a member of the Council of the Association of American Geographers.